PJPS
PAKISTAN JOURNAL OF PLASTIC SURGERY
ISSN #: 2307-213X
Volume 11, Issue 01, March 2023

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Research Article

Alarming Incidence of Paediatric Hand Injuries Due to Domestic Donkey Pump: A Preventable Public Healthcare Issue

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Abstract

Background: Donkey pumps are commonly used in Pakistan households to pump water but are open the cause of hand injuries especially in children. This article aims to highlight the alarming incidence of such injuries leading to crippled hand in children.

Methodology: This retrospective study was conducted at one the busiest tertiary care hospitals, Civil Hospital, Karachi, from July 2017 to January 2020, by reviewing the medical records of patients. All children, less than 14 years old, who present with hand trauma due to donkey pump in ER or OPD were included. Gender, hand dominance, type of injury, number of involved fingers, and presence of any fracture or tendon injury were recorded. Data analysis was done with SPSS 22.0.

Results: A total of 147 children presented with hand injury due to donkey pumps. 105 (71.42%) were boys and 42 (28.5%) were girls. 75.4 % were right-handed and 24.5 % were left-hand dominant. Most frequent was the involvement of single-digit. Regarding injury pattern, severyl crushed fingers were present in 36.7% of injuries. Fingertip injury without any fracture was present in 22.4%, 34.7% had an injury to distal phalanx with tuft fracture, 6.1% of injuries involved middle and proximal phalanx with fracture. All cases were accidental in nature.

Conclusion: Domestic Donkey Pumps cause an alarming incidence of hand injuries in children, which can be prevented by ensuring these pumps are safe for household use.

Received | 19-03-2022 **Revised**| 06-02-2023 **Accepted** | 20-02-2023

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Keywords | Hand injury, Domestic donkey pump, prevention, hand fractures,

Introduction

The innate response of a child to touch or grasp things that intrigue him may offer assistance in early learning and development but this innocent concern in some cases may end up injuring the child. Consequently, hand injuries are a common presentation in paediatric emergencies.[1] These may be in the form of fingertip injury, subungual injury, bites, lacerations, fractures, burns, etc. Hand fractures account for 15% of all paediatric fractures, and 2.3% of emergency visits.[2,3] Some of these injuries have the potential to cause permanent deformities and life-long implications such as scar contracture, removal of the nail, or restriction of growth of the hand even when the injuries were trivial events.[4,5]

Water is probably God's greatest bounty, and a necessity for life. However, due to exploitation, water resources are depleting rapidly. Pakistan is also facing a water shortage problem for last several years.[6] The repercussion of this is the installation of domestic donkey pumps in many households throughout the country

Donkey pump works on the principle of electric powered motor which, with the help of a belt rotates a wheel. The wheel is connected to the suction body by a shaft. The rotation of the wheel rotates the suction body and sucks water from the well or tank. Figure 1 shows the

shape of a donkey pump which is present in markets and conventionally used in homes. There are no proper safety mechanism in the pumps, in that there is no covering of the wheel, belt or motor, and they are open. Children usually get attracted to rotating wheel and poke fingers in it or try to grab the wheel. Hence unfortunately, these donkey pumps become a source of severe paediatric hand injuries, as shown in figure 2.

Managing pediatric hand injuries can be more challenging as compared to adult injuries owing to factors like the presence of open physis, lack of patient compliance[1], and a shorter time window for intervention[2,7]. Another noteworthy impediment confronted by our country is the absolute shortage of properly trained hand surgeons. Moreover, they are mostly available in major cities[8]. Therefore, the majority of children present late, and are often already operated upon by non-specialists, further complicating the situation.

Together these factors make it difficult for us to restore the functionality of the hand. Hence, critical evaluation, appropriate primary care, and timely referral are of paramount importance to optimize outcomes. Nevertheless, the prevention of such evitable injuries should be the first goal. Due to the non-availability of data in Pakistan with such types of injuries, our study can be a reference that can be used by the public and private sectors for awareness and prevention of these injuries.

Figure 1: *A Donkey Pump*

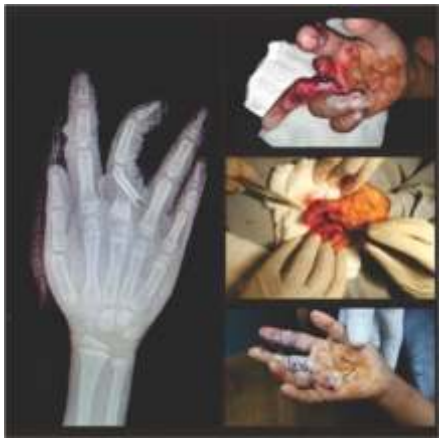

Figure 2: *Trauma to right hand of a 3 years old child. Fracture was reduced and splintage was done. Bony fixation was avoided due to doubtful vascularity of finger. 4th day after revascularization shows bright red bleeding from needle prick*

Methodology

This descriptive retrospective study was conducted at Dr. Ruth K.M. Pfau, Civil Hospital Karachi's plastic surgery unit. The record was searched for the children aged 1 – 14 years who presented with hand injury secondary to domestic donkey pump from July 2017 to January 2020. The following data variables were extracted from the records: patient's age, gender, dominant and non-dominant hand involvement, number of digits involved, soft tissue involvement, and associated fractures. Some patients visited the emergency department directly while some were referred from other clinics or hospitals after primary care or failed treatment. Statistical analyses of data were performed using IBM SPSS ver. 22.0 for Windows.

Results

A total of 147 children presented with hand injury due to domestic donkey pump during this time period. Amongst them 105 (71.42%) were boys and 42 (28.5%) were girls. Most patients were right hand dominant (75.5%), whereas few were left hand dominant (24.5%). The majority of the injuries involved the dominant hand (82.3%) with injury to the non-dominant hand seen in 17.7% as shown in table 1.

Table 1: *Pattern of injury according to hand dominance*

	Frequency	Percent
Right hand dominant	111	75.5
Left hand dominant	36	24.5
Injury of dominant hand	121	82.3
Injury of non-dominant hand	26	17.7

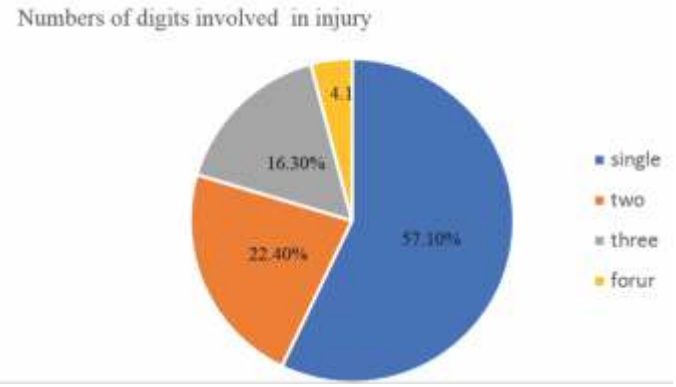

Figure 3 *Pie-Chart demonstrating the Frequency of Involvement of Various Digits.*

Injury to the number of digits differed amongst the patients. The frequency of single-digit involvement was most common (n=84), whereas a gradual decrease in frequency of two, three- and four-digit injury was seen with no injury involving all five digits as shown in figure 3.

Table 2: *Extent of Injury*

	Frequency	Percentage
Injury to Fingertip without any fracture	33	22.4
Injury to Distal Phalanx with Tuft Fracture	51	34.7
Injury involving middle and proximal phalanx with fracture	9	6.1
Severely crushed fingers	54	36.7
Total	147	100.0

Discussion

Children due to their innate curiosity to touch and grab objects in their surroundings are susceptible to a wide spectrum of injuries. Lawn mowers,[9] treadmills,[10] sports,[11] and burns[12] can cause injuries to children at home. Up to the best of our knowledge, no data is available on domestic donkey pump injuries in children locally or internationally. In developed countries, the likely reason for this is because such pumps are not used at home.

The huge number of patients presenting specifically with donkey pump injury is alarming, considering this is over a short span of just 30 months. The majority of patients who presented with this type of injury were males and this is similar to other studies conducted.[13,14]

Being a tertiary care unit with well-trained hand specialists, the majority of these patients recovered well. Our treatment protocol was bookish in the majority of these children. Injury to Fingertip without any fracture was managed with primary closure in case of availability of soft tissues. Where there was soft tissue loss, the wounds were managed conservatively with daily dressings with very good results due to the excellent healing capacity of the pediatric population.[15]

For those who had an injury to the distal phalanx with tuft fracture, the management plan was based on the soft tissue availability. If enough soft tissue was present then a simple k-wire fixation was done. If there was soft tissue loss along with fracture then the defect was covered with various flaps and the fracture was fixed using a K-wire.This is standard management for such of injuries.[16] Once K-wires were in place, they were protected with a cast or brace at all times, and removed in 3-4 weeks. We observed that in injuries involving fractures of middle and proximal phalanx, majority of the fractures were displaced, due to the impact of trauma and young age. Priority was closed reduction and fixation with K wire.

Crush injuries often have unfavourable functional outcomes. Unfortunately they are a common injury pattern seen with donkey pumps. 54 children presented with severely crushed fingers in our study. Out of these, we were able to save only 18 fingers that functioned properly, 21 were saved without any significant functional restoration and 15 ended up with amputation.

Those who present with tendon injury recovered well with none of them requiring further surgery for functional improvement. These results are similar to the study by Grobbelaar,[17] but different from Fitoussi et al who reported tendon rupture in 9% of their study population, especially in the very young children with a short postoperative immobilization.[18]

The vast majority of our patients suffered from an injury on the dominant hand which is also seen in almost every study done on the relationship between hand dominance and hand trauma.[13,14,19]

Our main focus was to highlight the very high incidence of such injuries in children so that we can make some recommendations for the prevention of accidental events. We do realize that donkey pumps might be a necessity in our country but we should make them safe for use by following the recommendations given below:

1. Every donkey pump should be fully covered.
2. Every pump should be installed with sensors that make them immediately stop in case of entrapment of anything in its belt.
3. There must be written warning signs about hazards it can cause especially to children.
4. Pumps should not be installed in the areas where they are easily accessible to children.
5. Government should also take immediate measures to overcome water shortage.
6. Government should pass a law and ban sellers who don't obey these recommendations.

Conclusion

Hand trauma with domestic donkey pump has an alarmingly high incidence, with younger male children being especially at risk. The trauma is often severe enough to cause amputation of involved digits. Prevention by way of safety and protection measures should

be developed, and advertisements regarding the danger of domestic donkey pumps should be considered.

Conflict of interest *None*

Funding Source *None*

References

1. Shah SS, Rochette LM, Smith GA. Epidemiology of pediatric hand injuries presenting to United States emergency departments, 1990 to 2009. J Trauma Acute Care Surg. 2012;72(6):1688–94.
2. Worlock P, Stower M. Fracture patterns in Nottingham children. J PediatrOrthop. 1986;6(6):656–60
3. Nellans KW, Chung KC. Pediatric hand fractures. Hand Clin. 2013;29(4):569–78
4. Liu EH, Alqahtani S, Alsaaran RN, et al. A prospective study of pediatric hand fractures and review of the literature. PediatrEmerg Care. 2014;30:299–304.
5. Shah SS, Rochette LM, Smith GA. Epidemiology of pediatric hand injuries presenting to United States emergency departments, 1990 to 2009. J Trauma Acute Care Surg. 2012;72:1688–1694.
6. Khoso, Salim & Ansari, Abdul Aziz. (2015). An overview on emerging water scarcity in Pakistan, its causes, impacts and remedial measures. Journal of Applied Engineering Science. Volume 13. 35-44. 10.5937/ jaes 13-6445.
7. Cornwall R, Ricchetti ET. Pediatric phalanx fractures: unique challenges and pitfalls. ClinOrthopRelat Res. 2006;445:146–56.
8. Wahba G, Cheung K. Pediatric hand injuries: Practical approach for primary care physicians. Can Fam Physician. 2018;64(11):803–810.
9. Vollman D, Smith GA. Epidemiology of Lawn Mower–Related Injuries to Children in the United States, 1990–2004. Pediatrics. 2006 Aug 1;118(2):e273-8.
10. Noffsinger DL, Johnson SR, Wheeler K, Shi J, Xiang H, Groner JI. Exercise treadmills: a cause of significant hand burns in young children. Journal of Burn Care & Research. 2017 Jul 1;38(4):215-9.
11. Trofa DP, Obana KK, Swindell HW, Shiu B, Noticewala MS, Popkin CA, Ahmad CS. Increasing Burden of Youth Baseball Elbow Injuries in US Emergency Departments. Orthopaedic journal of sports medicine. 2019 May 13;7(5):2325967119845636.
12. Marchalik R, Rada EM, Albino FP, Sauerhammer TM, Boyajian MJ, Rogers GF, Oh AK. Upper extremity friction burns in the pediatric patient: a 10-year review. Plastic and Reconstructive Surgery Global Open. 2018 Dec;6(12).
13. Vadivelu R, Dias JJ, Burke FD, Stanton J. Hand injuries in children: a prospective study. Journal of Pediatric Orthopaedics. 2006 Jan 1;26(1):29-35.
14. Bhende MS, Dandrea LA, Davis HW. Hand injuries in children presenting to a pediatric emergency department. Annals of emergency medicine. 1993 Oct 1;22(10): 1519-23.
15. Gellman H. Fingertip-nail bed injuries in children: current concepts and controversies of treatment. Journal of Craniofacial Surgery. 2009 Jul 1;20(4):1033-5.
16. Charnley, J. The closed treatment of common fractures. Cambridge University Press; 2003.
17. Grobbelaar AO, Hudson DA. Flexor tendon injuries in children. The Journal of Hand Surgery: British & European Volume. 1994 Dec 1;19(6):696-8.
18. Fitoussi F, Lebellec Y, Frajman JM, Penneçot GF. Flexor tendon injuries in children: factors influencing prognosis. Journal of Pediatric Orthopaedics. 1999 Nov 1; 19(6):818.
19. Hill C, Riaz M, Mozzam A, Brennen MD. A regional audit of hand and wrist injuries: a study of 4873 injuries. Journal of Hand Surgery. 1998 Apr;23(2):196-200.

Research Article

Pre-maxillary Turn Over Palatal Flap For Bilateral Cleft Palate Repair

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Abstract

Background: Palatal fistula is the most common complication following cleft palate repair with a reported incidence of 4% to 58%. Ample reconstructive options are described in literature and are in practice. We demonstrate incorporation of Pre-maxillary turn over palatal flap in bilateral cleft palate repair which will aid in reducing rate of anterior palatal fistulas.

Methodology: This was a prospective study conducted at Liaqat National Hospital over a 2-year period (Jan 2019 – Dec 2020). 13 patients planned to undergo bilateral cleft palate repair were included in the study. In all these patients a premaxillary mucoperiosteal turn-over flap was incorporated into the nasal lining. Patients were followed up for 2 years. Early (dehiscence, flap necrosis and fistula formation), and late complications (VPI) were assessed and recorded.

Results: The mean age at the time of intervention was 7.61 months. Eight were males (61%) and 5 were females (38%). There was a partial wound dehiscence of oral lining in one patient, which was most likely secondary to poor oral hygiene as parents were non-compliant to the instructions given. There was no incidence of flap necrosis or fistula formation. None of the patients had VPI at 2 years follow-up.

Conclusion: Incorporation of Pre-maxillary turn over palatal flap for selected bilateral cleft palate repair reduces anterior fistula formation, which is often difficult to close causing hindrance in alveolar cleft closure.

Received | 20-03-2022 **Revised** | 02-01-2023 **Accepted** | 22-02-2023

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Keywords | Cleft palate, Bardach's two flap technique, pre-maxillary turn over flap, palatal fistula, muco-periosteal flap

Introduction

Cleft palate is among the common congenital defects of the palatewhich causes oral and nasal deformity. It has a reported incidence of 1 in 500 to 1000 live births, predominantly affecting males, and with variation among different regions and ethnic groups.[1,2] It causes difficulty with feeding and speech, and is considered a social stigma. Cleft palate can occur either in isolation or in association with congenital syndromes.[3,4,5,6] There are various types of cleft palate seen in routine practice. Numerous procedures are described for palate repair in literature with a number of modifications published by elite plastic surgeons throughout the world. Complications after cleft palateinclude wound dehiscence, flap necrosis, and fistula formation in early period and velo-pharyngeal insufficiency later. Palatal fistula is the most common complication following cleft palate repair with a reported incidence of 4% to 58%,[7] and can occur either in hard or soft palate. Those occurring between the alveolar arch and incisive foramen are called anterior palatal fistula.[8,9] Deficient nasal lining in this region contributes to the formation of anterior palatal fistulae. We incorporated pre-maxillary palatal turn over flap in bilateral cleft palate repair to augment the nasal lining of this region to decrease the risk of anterior palatal fistulae.

Methodology

The prospective study was conducted over a period of 2 years (January 2019 to December 2020) at the department of plastic and reconstructive surgery, Liaquat

national hospital, Karachi, Pakistan. Inclusion criteria were age ⩾ 6 months and ⩽ 12 months, and weight ⩾ 8 Kg. Under standard surgical protocol, they underwent bilateral cleft palate repair (primary repair). Pre-maxillary turn over palatal flap was integrated during bilateral cleft palate repair using Bardach's two-flap technique.[11] All received standard post-operative care. Parents were given clear instructions at the time of discharge so as to reduce the chances of patient related factors leading to failure of surgery/complications. Patients were followed post-operatively on weekly basis for 6 weeks and then fortnightly, with a total follow up of 3 months to assess early complications (e.g wound dehiscence, flap necrosis, and fistula formation) and further followed for 3 years for late complications like velo-pharyngeal insufficiency. Pre lingual speech evaluation was done at 2 years and formal speech evaluation done at 3 years of age. All details were collected on a proforma and relevant pictures were taken after taking written informed consent from parents, keeping patient identity and details confidential.

Surgical Technique:

Oral intubation was done by a senior experienced anesthetist. Under standard aseptic measures, Bardach's two-flap technique was followed for palate repair. Along with it a small rectangular full thickness muco-periosteal flap was raised from the palatal pre-maxilla which was turned over to 180 degrees and incorporated in the nasal layer of the bilateral cleft repair. Palatal mucosal flaps are advanced as described by Bardach's and sutured to raw pre-maxilla (Figures 1 and 2).

Figure-1: *Demonstrating steps of pre-maxillary turnover flap for bilateral cleft palate repair. a) Basic anatomy of cleft palate, b) incisions marked, c) Flaps mobilized and dissection done to separate nasal and oral layers, d) closure of the nasal layer with incorporation of pre-maxillary turnover flap, e) final closure.*

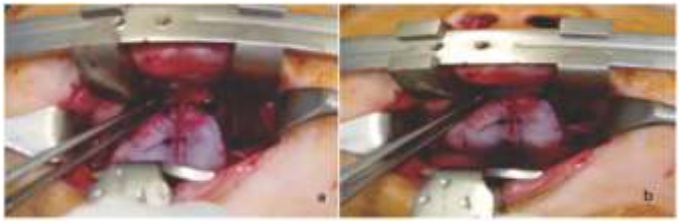

Figure 2- *Demonstrating pre-maxillary turnover flap for bilateral cleft palate repair*

Results

The mean age at the time of intervention was 7.61 months. Eight were males (61%) and 5 were females (38%) (Table 1). All patients were followed for 6 weeks on weekly bases during which complete wound healing was observed in all patients except one who developed partial wound dehiscence which eventually healed conservatively. There was no evidence of fistula formation during the study period. None of the patients went on to develop VPI in this study. (Table 2)

Table 1: *Patient demographics*

Age	**7.61(±0.8) months**
Gender	
Males	8 (61%)
Females	5 (38%)
Weight	11.5 (±0.9) Kg
Ethnicity	Asians (Indian Asian)

Table 2: *Complications after complete cleft palate repair*

	Wound dehiscence	**Complete**	**0**
		Partial	1
Early	Fistula formation		0
	Flap necrosis		0
	Breathing Difficulty		0
Late	VPD		0

Discussion

Fistula formation after cleft palate repair is one of the common complications encountered by plastic surgeons. Although basic principles of a two layered closureis followed universally, the incidence of palatal fistula ranges between 4 to 58%.[7] Pittsburgh et al., described a classification system for palatal fistula.[11] Complications after fistula formation include nasal regurgitation, nasal emission, tooth caries, poor oral hygiene, fetor oris and hyper nasal speech. Meticulous dissection of the flaps with preservation of the blood supply and tension free closure of both the nasal and oral layers of the cleft palate repair reduces the chance of palatal fistula formation and related complications. A number of techniques have been described in literature for the treatment of palatal fistula.[12-16] These include local myo-mucosal flap, vomer flap, inferior turbinate flapamdFAMM flap. All of these can be utilized for both oral and nasal lining defects. Among the above mentioned, vomer flap, inferior turbinate flap and buccal pad fat are well known to be utilized in primary repair of bilateral cleft palate.[17,18,19,20]

Our study demonstrated, the successful incorporation of pre-maxillary palatal turn-over flap in primary bila-

teral cleft palate repair, and reduction in the incidence of palatal fistula. It is particularly useful in closure of wide cleft palate. Our results demonstrated that such a modification in primary bilateral cleft palate repair is worth mentioning.

Conclusion

Our study demonstrated overall good results of bilateral cleft palate repair with pre-maxilla palatal turnover flap, allowing tension free closure of nasal layer and reducing the risk of fistula formation.

Conflict of interest *None*

Funding Source *None*

References

1. Baig S, Bhutta MF, Hashmi FP, Khan K, Iqbal UA, Bhatti ZI. Frequency of cleft lip and cleft palate in Pakistan. The Professional Medical Journal. 2022 Apr 30;29(05):671-5
2. Phalke N, Goldman JJ. Cleft Palate. StatPearls [Internet]. 2020 Oct 3.
3. Kirschner RE, LaRossa D. Cleft lip and palate. Otolaryngol Clin North Am. 2000 Dec;33(6):1191-215, v-vi.
4. Worley ML, Patel KG, Kilpatrick LA. Cleft Lip and Palate. ClinPerinatol. 2018 Dec;45(4):661-678.
5. IPDTOC Working Group. Prevalence at birth of cleft lip with or without cleft palate: data from the International Perinatal Database of Typical Oral Clefts (IPDTOC). Cleft Palate Craniofac J. 2011 Jan;48(1):66-81.
6. Ysunza PA, Pamplona MC, Repetto G. Cleft Palate, Interdisciplinary Diagnosis, and Treatment. Biomed Res Int. 2015;2015:701850.
7. Rahpeyma A. Premaxillary palatal flap (PPF) as an aid to create nasal floor in anterior palatal fistula closure of cleft patients. Technical note. International Journal of Surgery. 2016 Jun 1;30:35-7.
8. Ibrahim FB, Khundkar SH, Mannan II, Ahmed T. Repair of Anterior Palatal Fistula by Local Mucoperiosteal Flap. Bangladesh Critical Care Journal. 2017 May 11; 5(1):17-22.
9. Rothermel AT, Lundberg JN, Samson TD, Tse RW, Allori AC, Bezuhly M, Beals SP, Sitzman TJ. A toolbox of surgical techniques for palatal fistula repair. The Cleft Palate-Craniofacial Journal. 2021 Feb; 58(2): 170-80.
10. Agrawal K. Cleft palate repair and variations. Indian Journal of Plastic Surgery. 2009 Oct;42(S 01):S102-9.
11. D.M. Smith, L. Vecchione, S. Jiang, M. Ford, F.W. Deleyiannis, M.A. Haralam, et al., The pittsburgh fistula classification system: a standardized scheme for the description of palatal fistulas, Cleft Palate Craniofacial J. Off. Publ. Am. Cleft Palate Craniofac. Assoc. 44 (2007) 590e594
12. A. Rahpeyma, S. Khajehahmadi, Inferior turbinate flap for nasal-side closure of palatal fistula in cleft patients: technical note, Plastic Reconstr. Surg. Glob. Open 2 (2014) e265.
13. M. Bagatin, N. Goldman, G.J. Nishioka, Combined tongue and pharyngeal flaps for reconstruction of large recurrent palatal fistulas, Arch. Facial Plastic Surg. 2 (2000) 146e147.
14. R.K. Mahajan, R. Chhajlani, H.C. Ghildiyal, Role of tongue flap in palatal fistula repair: a series of 41 cases, Indian J. Plastic Surg. Off. Publ. Assoc. Plastic Surg. India 47 (2014) 210e215.
15. J. Murthy, Descriptive study of management of palatal fistula in one hundred and ninety-four cleft individuals, Indian J. Plastic Surg. Off. Publ. Assoc. Plastic Surg. India 44 (2011) 41e46.
16. Rothermel AT, Lundberg JN, Samson TD, Tse RW, Allori AC, Bezuhly M, Beals SP, Sitzman TJ. A toolbox of surgical techniques for palatal fistula repair. The Cleft Palate-Craniofacial Journal. 2021 Feb; 58(2): 170-80.
17. Jackson IT, Moreira-Gonzalez AA, Rogers A, Beal BJ. The buccal flap—a useful technique in cleft palate repair?. The Cleft palate-craniofacial journal. 2004 Mar; 41(2):144-51.
18. Agrawal K, Panda KN. Use of vomer flap in palatoplasty: revisited. The Cleft palate-craniofacial journal. 2006 Jan;43(1):30-7.
19. Adeyemo WL, Ibikunle AA, James O, Taiwo OA. Buccal fat pad: a useful adjunct flap in cleft palate repair. Journal of Maxillofacial & Oral Surgery. 2019 Mar;18(1):40.
20. Khan I, Cho N, Ahmed M, Ahmed O, Beg MS. The application of buccal fat pad to cover lateral palatal defect causes early mucolization. Cureus. 2021 Aug 29; 13(8).

Research Article

Dermal Fat Graft Versus Bone Graft for Maxillary Augmentation in Cleft Rhinoplasty

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Abstract

Background: Secondary cleft lip Rhinoplasty is a difficult surgery to perform due to its abnormal anatomical features. There is an anomalous insertion of orbicularis oris in alar base on cleft side along with maxillary deficiency. The collapsed lateral crura and malar region needs structural support for better symmetry. The maxillary augmentation can be done via autogenous iliac bone graft, costal cartilage graft, dermal fat graft and alloplastic materials. The objective of the study is to compare the outcome of dermal fat graft with bone graft for maxillary augmentation.

Methodology: This was a retrospective study done at Liaqat national hospital , Karachi. All patients who presented to outpatient department for cleft rhinoplasty between July, 2015 to December, 2020 were included. Outcome was assessed using visual analog score by surgeon, patient and an independent assessor, after all patient had completed 6-month follow-up. Data analysis was done with SPSS version 21.

Result: 38 patients were included in the study. 20 had maxillary augmentation with dermal fat graft. 18 had bone graft. Mean Visual Analogue Score for iliac bone graft was 7.5 whereas for dermal fat graft it was 8.3.

Conclusion: Patients who had maxillary augmentation with dermal fat graft showed better results on visual analogue score as compared to patients who had augmentation with iliac bone graft.

Received | 19-04-2022 **Revised** | 19-01-2023 **Accepted** | 24-02-2023

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Keywords | Maxillary augmentation, Cleft rhinoplasty, Dermal fat graft, Bone graft

Introduction

Surgery of the cleft nasal deformity is very challenging to perform even for skilled rhinoplasty surgeons due to its complex pathology and limitations in post-operative result.[1,2] Many techniques have been introduced since 1920 for the correction of cleft nasal deformity, which shows the difficult nature of cleft rhinoplasty.[3]

The degree of the labial cleft is directly proportional to the severity of nasal abnormality. Both unilateral and bilateral cleft nasal deformity share more or less same anatomical features which include abnormal insertion of orbicularis oris into the alar base and maxillary hypoplasia of the cleft side.[4] Maxillary hypoplasia leads to malocclusion and facial contour asymmetry. The collapsed lateral crura and malar region needs structural support for better symmetry.[5] Pyriform aperture of the maxilla supports nasal platform, so it needs to be addressed while performing cleft rhinoplasty.[6]

Many studies have suggested different types of grafts that can be used for augmentation in cleft rhinoplasty. Autogenous iliac bone graft, costal cartilage graft (6th, 7th, 8th and even 10th rib) and dermal fat graft have all traditionally been used by different rhinoplasty surgeons.[4,7,8,9,10] There is paucity of data comparing these techniques to determine which has better outcomes. The rationale of this study is to compare outcomes of maxillary augmentation with bone graft versus dermal fat graft.

Methodology

This retrospective study was done at Liaqat National

Hospital, from July 2015 to December 2020. The medical records of all patients aged 10 and above who underwent correction of cleft nasal deformity during this time period were extracted from Hospital Information System and reviewed. Patients who had nasal deformities other than those seen on cleft patients were excluded. All patients had been operated by a single surgeon after-baseline workup. All patients received routine post operative care and instructions at discharge. They were followed up for 6 months. Details of any complications encountered and their management was also recorded.

Data analysis:

The outcome was assessed using Visual Analogue Score. The patient, surgeon, and a third observer (assessor) scored the following parameters on a scale of 1-10 with score 1 referring to extremely dissatisfied and score 10 indicating extremely satisfied. Parameters which were assessed included: Improvement in the natural contour of maxilla, improvement on frontal view, satisfaction with post-operative result, improvement in height of maxilla at conversational distance and improvement of symmetry of augmented side with the non-cleft side.

Data was analyzed in SPSS version 22.0, mean was calculated and reported. Average Visual Analogue Score for both bone graft and dermal fat graft groups was compared using independent t-test (p-value £0.05 taken as significant).

Operative technique: All surgical procedures were done under general anesthesia with the oral endotracheal tube pointed in a caudal direction.

Dermal Fat Graft Harvest: The dermal fat graft was harvested from the groin region in an elliptical fashion. The required graft was marked and 1% xylocaine with adrenaline local anesthetic solution was infiltrated. The area was de-epithelized in situ in a uniform fashion with surgical blade 10. The graft was taken with dermis and subcutaneous fat. The dermal fat graft was wrapped in wet gauze soaked with 0.9% normal saline. Hemostasis was secured and the donor site closed primarily.

Iliac Bone Graft Harvest: The iliac crest was marked along with anterior superior iliac spine. The incision was marked below the iliac crest (by lifting the skin upwards to hide the scar) and 2 cm posterior to anterior superior iliac spine. After infiltration with 1% xylocaine with adrenaline, the incision was given and deepened below the muscles. The cartilage cap was removed in a lid fashion with hammer and chisel. The desired size was marked on iliac bone and a unicortical graft harvested. Wound was closed in layers.

Recipient Site: An open approach was used by giving transcolumellar stepladder incision, along withan intranasal infra-cartilaginous incision, to expose the nasal framework. Limited pocket dissection was performed by dissecting soft tissue off the pyriform with freer dissector. The graft was inserted and placed over the hypoplastic maxilla. The mucosa was then closed with a 4-0 running vicryl suture.

Results:

The total number of patients who were operated on from July 2015 to December 2020 were 38. 20 patients had maxillary augmentation with dermal fat graft and 18 patients with iliac bone graft.

Patients age ranged between 10-40 years. The average score given on each assessed parameter by the surgeon, patient and assessor for augmentation with dermal fat graft is summarized in Table 1 and that for bone graft is summarized in Table 2.

Mean Visual Analogue Score (Combined Mean of all three, that is surgeon, patient and assessor) for augmentation with bone graft was 7.5 (± 0.4) whereas for augmentation with dermal fat graft was 8.3(± 0.4), they were compared using independent t-test and found to

Table 1: *Mean Vas Score For Augmentaion With Dermal Fat Graft*

	surgeon	patient	assessor
Improvement in the natural contour of maxilla	7.8	8.7	8.0
Improvement in frontal view	8.4	8.7	8.2
Satisfaction with post-operative results	8.4	8.8	8.7
Improvement in height of maxilla at conversational distance	8.5	8.6	8.6
Improvement of asymmetry of augmented and non-cleft side	7.5	7.9	8.1
Total score (Mean)	8.1	8.5	8.3

Table 2: *Mean Vas Score For Augmentation With Bone Graft.*

	surgeon	patient	assessor
Improvement in the natural contour of maxilla	7.5	8.3	7.2
Improvement in frontal view	8.0	7.7	7.5
Satisfaction with post-operative results	8.2	7.6	7.5
Improvement in height of maxilla at conversational distance	8.1	7.8	7.7
Improvement of asymmetry of augmented and non-cleft side	7.1	7.0	7.0
Total score (Mean)	7.7	7.6	7.3

be statistically significant (p-value < 0.01), shown in Table 3.

In the bone graft group, one (5.5%) patient complained about palpable bone graft post operatively, and six

Table 3: *Comparison of Mean Visual Analogue Score for Dermal Fat Graft and Bone Graft*

	Dermal Fat Graft (Mean ± SD)	Bone Graft (Mean ± SD)
Mean Visual Analogue Score (Combined mean of surgeon, patient and assessor)	8.3 ± 0.4	7.5 ± 0.4

(33.3%) patients had under correction at 6 months due to resorption of bone. Hence, a total of Seven (38.8%) patients out of 18 in bone graft group showed complications, whereas none of the patient (0%) whose augmentation was done with dermal fat graft reported any such complications.

Figure 1 shows a patient who underwent maxillary augmentation with dermal fat graft and Figure 2 depicts a patient who underwent augmentation with iliac bone graft.

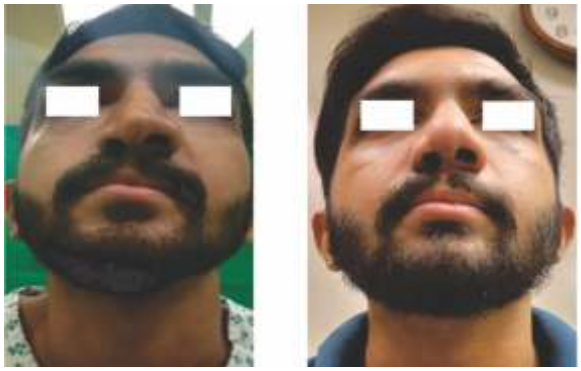

Figure 1 : *A: Pre-operative picture (worm's eye view) B: Post-operative picture (worm's eye view) showing maxillary augmentation with dermal fat graft on right maxilla*

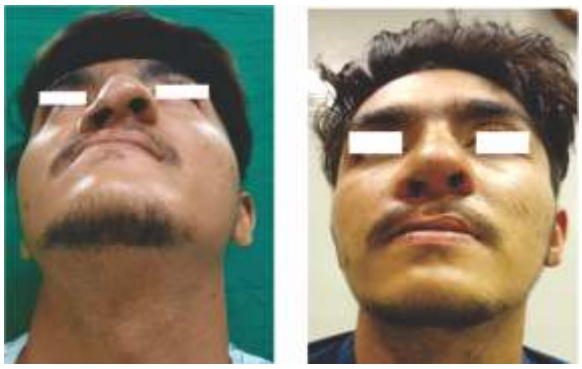

Figure 2: *A: Pre-operative picture (worm's eye view) B: Post-operative picture (worm's eye view) showing maxillary augmentation with bone graft on right maxilla*

Discussion

The pyriform aperture is an integral component to support the alar base and provide platform to the nose.[6] The complexity of the abnormalities varies with individual case of the cleft lip deformity and its progressive severity. Several causative factors are anatomical differences, scarring from previous surgeries and resultant restrictive growth of maxilla which leads to depressed alar base.[5]

The pyriform aperture is anatomically formed by the nasal bone superiorly and maxilla inferiorly and laterally.[6] It is a significant structure forming the nasal platform.[11,12] Zemann et al. and Fisher et al, have stated the anatomical differences in the maxilla of cleft patients.[13,14] The alar base is located posteriorly and laterally on cleft side as compared to the non-cleft side due to the abnormal attachment of orbicularis oris. The pyriform aperture augmentation with free dermal fat graft or on-lay iliac bone graft can elevate the depressed alar base and make it more symmetrical to the normal side.

Various materials can be used for augmentation of alar base. These include bone, cartilage, free dermal fat graft and synthetic materials which can be bio-integrable as well.[4,10] Our study has observed the differences in outcomes of alar base augmentation in two groups. We have demonstrated better results with dermal fat graft in comparison to on-lay iliac bone graft with statistically significant results.

The Dermal Fat Graft has two components, fat and dermis. In 1983, practice of using fat graft for facial soft tissue contour defects was initially testified. Since then, dermal fat grafts are commonly used for facial contour deformities with very good result, as shown by Davis etal.[15] Recently, it's usefor aesthetic purposes has also been well explained.[16] The groin has thinnest dermis, which makes it useful for aesthetic surgery with good skin laxity. An ample amount of graft can be harvested with inconspicuous scar with primary closure.

The advantages of dermal fat graft are its biocompatibility, minimal donor site morbidity, durability, short operating time, resistance to infection, less hospital stay and easy postoperative management.[17] There are few tactics which can be used to avoid graft resorption. These include ensuring grafts are not thicker than two centimeters, gentle graft tissue handling, vascular bed, good hemostasis of the recipient site to avoid hematoma, graft immobilization and infection avoidance. The

dermal fat grafts can survive in radiated patients also. The explanation for graft survival has two main reasons which are dermal component andproangiogenic properties to enhance its vascularity at recipient site.[18]

Complications of dermal fat grafts are decrease in graft volume and cyst formation. The volume reduces evidently within 2 or 3 months post-operatively, but steadies afterwards.[19] In the literature the volume loss is reported to be from 1%–2% to 10%– 20% in first year.[20]

For bone grafting iliac bone is a preferred donor site. It provides good amount and quality of bone with both cortical and cancellous components. It is easily approachable. It has no foreign body reaction, with low chances of infection.[21] However, some disadvantages include low contouring abilities, non-mouldability, donor site pain and resorption at recipient site.[4,9,22,23]

The limitation of our study included the lack of an objective scale to evaluate the augmentation by comparing pre and postoperative parameters. Secondly, we didn't conduct histology to identify the resorption in iliac bone graft and dermal fat graft. Our study is a single center, retrospective study with limited number of patients.

Conclusion

Alar base augmentation efficiently re-establishes the alar base on the cleft side. Patients who had maxillary augmentation with dermal fat graft showed better results on visual analogue score as compared to patients who had augmentation with iliac bone graft.

Conflict of interest *None*

Funding Source *None*

References

1. Cuzalina, Angelo, and Calvin Jung. "Rhinoplasty for the cleft lip and palate patient." Oral and Maxillofacial Surgery Clinics 28, no. 2 (2016): 189-202.
2. Nolst Trenité, Gilbert J., Richard HL Paping, and Albert H. Trenning. "Rhinoplasty in the cleft lip patient." The Cleft palate-craniofacial journal 34, no. 1 (1997): 63-68.
3. Madorsky, Simon J., and Tom D. Wang. "Unilateral cleft rhinoplasty: a review." Otolaryngologic Clinics of North America 32, no. 4 (1999): 669-682.
4. Moore, Meredith L. Grogan, Thu-Hoai C. Nguyen, Kristopher M. Day, and Adam B. Weinfeld. "Pyriform Costal Cartilage Graft Improves Cleft-Side Alar Asymmetry in Secondary Cleft Rhinoplasty." The Cleft Palate-Craniofacial Journal 57, no. 5 (2020): 537-542.
5. Talaat, Wael M., Mohamed M. Ghoneim, Yasser M. El-Shikh, Sherif I. Elkashty, Mohammed AG Ismail, and Tarek FA Keshk. "Anthropometric analysis of secondary cleft lip rhinoplasty using costal cartilage graft." Journal of Craniofacial Surgery 30, no. 8 (2019): 2464-2468.
6. Kim, Yong Bae, Seung Min Nam, Eun Soo Park, Chang Yong Choi, Moon Seok Kang, and Han Gyu Cha. "The Effects of Alar Base Augmentation in Secondary Unilateral Cleft Lip Nasal Deformity." Journal of Craniofacial Surgery 32, no. 2 (2021): 525-529.
7. Cunha, Giovanni, Audrey Foster Lefort Rocha, Valfrido Antônio Pereira Filho, Mario Francisco Real Gabrielli, and Marisa Aparecida Cabrini Gabrielli. "Atrophic maxilla reconstruction with autogenous iliac graft and guided dental implants." Journal of Craniofacial Surgery 29, no. 8 (2018): 2218-2219.
8. Kim, Jae Hoon, Jin Woo Song, Sung Wan Park, Won Suk Oh, and Joo Heon Lee. "10th rib cartilage: another option of the costal cartilage graft for rhinoplasty." Archives of Aesthetic Plastic Surgery 21, no. 2 (2015): 47-53.
9. Tetè, Stefano, Raffaele Vinci, Susi Zara, Vincenzo Zizzari, Alessandro De Carlo, Giorgio Falco, Domenico Tripodi, Amelia Cataldi, Carmen Mortellaro, and Enrico Gherlone. "Long-term evaluation of maxillary reconstruction by iliac bone graft." Journal of Craniofacial Surgery 22, no. 5 (2011): 1702-1707.
10. Erdogan, Bulent, Asuman Tuncel, Gokhan Adanali, Orgun Deren, and Meltem Ayhan. "Augmentation rhinoplasty with dermal graft and review of the literature." Plastic and reconstructive surgery 111, no. 6 (2003): 2060-2068.
11. Mommaerts, Maurice Y., Frank Lippens, Johan VS Abeloos, and Lucas F. Neyt. "Nasal profile changes after maxillary impaction and advancement surgery." Journal of oral and maxillofacial surgery 58, no. 5 (2000): 470-475.
12. Pessa, Joel E., Lisa D. Desvigne, and Vikram P. Zadoo. "The effect of skeletal remodeling on the nasal profile: considerations for rhinoplasty in the older patient." Aesthetic plastic surgery 23, no. 4 (1999): 239-242.
13. Zemann, W., G. Santler, and H. Kärcher. "Analysis of midface asymmetry in patients with cleft lip, alveolus and palate at the age of 3 months using 3D-COSMOS measuring system." Journal of Cranio-Maxillofacial Surgery 30, no. 3 (2002): 148-152.
14. Fisher, David M., Lun-Jou Lo, Yu-Ray Chen, and M. S. Noordhoff. "Three-dimensional computed tomographic analysis of the primary nasal deformity in 3-month-old infants with complete unilateral cleft lip and palate." Plastic and reconstructive surgery 103, no. 7(1999): 1826-1834.
15. Davis, Richard E., Robert A. Guida, and Ted A. Cook. "Autologous free dermal fat graft: reconstruction of facial contour defects." Archives of Otolaryngology–Head & Neck Surgery 121, no. 1 (1995): 95-100.

16. Little, J. William. "Applications of the classic dermal fat graft in primary and secondary facial rejuvenation." Plastic and reconstructive surgery 109, no. 2 (2002): 788-804.
17. Issa, Sabah Abdul-Aziz, and Mustafa Emaduldeen Jameel. "Free Dermal Fat Graft for Reconstruction of Soft Tissue Defects in the Maxillofacial Region." Craniomaxillofacial Trauma & Reconstruction 13, no. 4 (2020): 260-266.
18. Nakakita, Nobuaki, Kouichirou Sezaki, Yasuharu Yamazaki, and Eiju Uchinuma. "Augmentation rhinoplasty using an L-shaped auricular cartilage framework combined with dermal fat graft for cleft lip nose." Aesthetic plastic surgery 23, no. 2 (1999): 107-112.
19. Fagrell, Dan, Sverker Eneström, Anders Berggren, and Barbara Kniola. "Fat cylinder transplantation: an experimental comparative study of three different kinds of fat transplants." Plastic and reconstructive surgery 98, no. 1 (1996): 90-6.
20. Choi, Min Hyub, Wei Jie He, Kyung Min Son, Woo Young Choi, and Ji Seon Cheon. "The efficacy of dermofat grafts from the groin for correction of acquired facial deformities." Archives of Craniofacial Surgery 21, no. 2 (2020): 92.
21. Kim, Gi-Jung, Young-Soo Jung, Hyung-Sik Park, and Eui-Wung Lee. "Long-term results of vertical height augmentation genioplasty using autogenous iliac bone graft." Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 100, no. 3 (2005): e51-e57.
22. Romano, James J., Nicholas T. Iliff, and Paul N. Manson. "Use of Medpor porous polyethylene implants in 140 patients with facial fractures." The Journal of Craniofacial Surgery 4, no. 3 (1993): 142-147.
23. Sabuncuoglu, Fidan, Altan Varol, Metin Şençimen, and Hüseyin Ölmez. "Onlay iliac bone grafting as an ancillary augmentation procedure for paranasal rejuvenation during bimaxillary surgery." Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 109, no. 2 (2010): e13-e19.

Research Article

Protocol for Safe Execution of Liposuction Procedure in An Ambulatory Set-up

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Abstract

Background: Liposuction is one of the most commonly performed surgical procedures by Plastic surgeons. The safety index of liposuction surgery is high but there is limited data of its safety as a day-care surgery. Generally, procedures done as day-care surgery are advantageous interms of cost effectiveness, resource utilization, and patient confidentiality. We share our experience of performing liposuction as a day-care procedure.

Methodology: A retrospective descriptive study design was chosen. All patients who underwent liposuction as a day-care procedure over a period of seven years from January 2013 to December 2019 were included. Their record was assessed for the criteria of patient selection for the procedure of liposuction, pre and peri-operative preparation, surgical technique, the total amount of fat removed, anaesthesia, post-operative care, and discharge. After discharge from the hospital, precise queries were made on a phone call, and patients or attendants were specifically inquired about the presence and intensity of symptoms like pain, bleeding, nausea, vomiting, blackout, or fall, or any serious condition that may require readmission to the hospital or emergency hospital visit.

Results: Out of a total of 208 patients, 120 (57.6%) were females, 88 (42.3%) were males. The procedures were done under different modes of anaesthesia, with general anaesthesia being given to the majority (59.1%). The average amount of fat removed during the procedure was 3.9 litres. The average BMI was 28.9. A very low percentage of patients had adverse effects like nausea (0.9%), pain (5.7%), and blackout (0.3%)

Conclusion: This study highlights that liposuction can be done safely as a day-care procedure with strict patient selection. Proper pre-operative, per-operative, and post-operative care and a very stringent follow-upensure success of this procedure in an ambulatory set-up.

Received | 19-03-2022: **Revised**| 06-02-2023 **Accepted** | 25-02-2023

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Keywords | Lipoplasty, Ambulatory set-up, Day-care surgery, surgical outcomes

Introduction

The surgical technique used for the removal of subcutaneous fat using suction-assisted aspiration cannulas introduced through small skin incisions for the purpose of body contouring, is called Liposuction[1]. Liposuction is one of the most regularly performed surgical procedures in the practice of plastic surgeons. The majority of patients prefer choosing a private day-care service for their cosmetic procedures to maintain their confidentiality and privacy.

Liposuction can be performed employing various methods like simple vacuum assisted,[1] vibroliposuction,[2] vaser,[3] laser,[4] heat, and cryolipolysis.[5] The various options for anaesthesia include local, spinal, epidural, and general anaesthesia. Selection of the technique of liposuction and form of anaesthesia is dependent not only on patients' condition but also upon the total amount of fat that needs to be aspirated considering

patient demands and their safety.

Day-care surgical units are established entities where patients are not retained in clinics during night hours. The main advantage of this is the convenience provided to both patients and surgeons. All new advents in the field of surgery and anaesthesiology are directed to make surgery safer for patients with minimum downtime and early recovery.[6]

Overall liposuction is a safe procedure, but there are certain risks one should consider before operating a patient as a day-care case.[7] Risks include bothersome pain, nausea, vomiting, bleeding requiring readmission in the unit, or emergencies like pulmonary embolism.[8] Any surgeon will be wary of such complications happening in their cosmetic surgery practice.

The senior author has been performing liposuction as daycare surgery from the year 2011 till date. Most common method of liposuction in our set-up is the vacuum and Vibro-assisted liposuctions, which have proven efficacy and high safety index[2]. Having vast experience of day-care surgeries, we are sharing our standard protocols for patient selection to make surgery as secure and conceivable as possible. We have also defined the protocol we follow to cautiously discharge the patients from the day-care unit, and ensure smooth recovery which is of prime importance.

In Pakistan, cosmetic surgery is still in its infancy. Very few surgeons set out to operate their patients in day-care units, to maintain a strategic distance from uncertainties and defacement. There is a paucity of literature dedicated to day-care cosmetic surgery. This study can offer assistance to our populace of both patients and specialists that cosmetic surgeries can be executed as day-care procedures if certain standards and protocols are strictly observed.

Methodology

This was a retrospective descriptive study, in which we reviewed the medical records of all patients who underwent liposuction as a day care surgery, over a period of 7 years from January 2013 to December 2019. Patients of either gender and of all ages, who underwent only liposuction were included.

Their record was assessed for the criteria of patient selection for the procedure of liposuction, pre and peri-operative preparation, surgical technique, the total amount of fat removed, mode of anaesthesia, post-operative care, and discharge. After discharge from the hospital, all patients were strictly followed up 5-6 times for the next 72 hours and very precise queries were made on a phone call. Patients or attendants were specifically inquired about the presence and intensity of symptoms like pain, bleeding, nausea, vomiting, blackout, or fall, or any serious condition that may require readmission in the hospital or emergency hospital visit.

Proper patient selection

Following strategies were applied for proper selection of patients:

1. The intrinsic risk factors were considered in selecting patients for day-care surgeries. The general health condition of the patient was assessed based on ASA score. Only those patients falling in ASA1 and ASA 2 categories were selected for day-care surgery.
2. Complete medical evaluation of a patient, based on history, physical examination, and specific laboratory studies was done by the surgeon and consultant anaesthesiologist15days before, and reassessed on the day of surgery.
3. Laboratory investigations (CBC, PT/INR, Anti HCV, HbsAg) were ordered in all patients. Choice of extra pre-procedure laboratory tests (CXR, ECG, ECHO, PFTS, lipid profile, and RBS) depended upon the patient's underlying medical conditions and the likelihood that results will affect the anaesthetic plan and safe recovery of patients.
4. Physical evaluation included general physical assessment and specific local examination of particular sites that require liposuction. The integumentary examination included detection of any infection, cellulitis, scars, stretch marks, signs of poor wound healing from previous procedures or trauma, keloids, hernias (abdominal, umbilical, inguinal, or incisional), and venous varicosities.
5. Psychosocial evaluation included analysis of weight stability, eating and exercise habits, genetic obesity. Patients were also evaluated for their emotional stability to endure the procedure. Comprehensive counselling sessions were conducted and patients were informed regarding procedural details, limitations, and expected outcomes. A history of prior cosmetic procedures was taken to exclude possible body dysmorphia.

Pre-operative and peri-operative preparation:

Informed written consent was taken from the patients for both anesthesia and surgery. The patient and/or

guardian were instructed regarding fasting protocol (6 hours nil per mouth before surgery) and medications to take or withhold. Patients with planned Epidural or Spinal anaesthesia had same protocols. Those who were not at risk of aspiration were allowed to take clear liquids until two hours before surgery. All patients were instructed to remove all ornaments, take shower before coming and beaccompanied by one family member. All surgeries were performed in the morning hours.

Anaesthesia:

Along with tumescent technique, either systemic, spinal, regional or epidural anaesthesia was given to ensure adequate patient comfort.[9] The mode of anaesthesia was chosen by the anaesthetist, depending on the overall health of the patient, the estimated volume of the aspirate to be removed, and the postoperative dismissal plan. A single dose of Cephradine was given intravenously at the time of induction of anaesthesia.

Infiltration solution:

- **Lidocaine:** Lidocaine is used as the anaesthetic agent in the wetting solution at the dose of 35mg/kg.
- **Epinephrine:** Epinephrine was added in tumescent fluid for haemostasis, dose of epinephrine was 0.7mg/kg.

Surgical technique:

We employed tumescent technique for lipolysis and VIBRO assisted liposuction was used for achieving removal of adipose tissue. Determination of liposuction volume was based on the Patient's BMI, functional status, age, and haemoglobin levels, to define the amount of fat that can be safely removed from their body. However, we never removed more than 5 litres to ensure patient safety.

Post-operative care:

After surgery, all patients were moved to the recovery cell, where their condition was strictly observed for one hour. Before shifting to the room, dressings were inspected for any soakage and changed if necessary. In the room, patients' vitals were regularly monitored. The median duration of NPO post-procedure was 6 hours. Gut sounds audibility was ensured before allowing oral intake.

Discharge:

The general condition of the patient was assessed and documented at the time of discharge. We ensured that they had no nausea or vomiting, were able to use the rest-room independently and that all dressings were dry. Patients were discharged on oral antibiotic (cephridine), Paracetamol, Diclofenac 50mg, Omeprazole 40mg, with SOS (if required) prescription of ondansetron for nausea.Detailed instructions were given to patients and attendants, both verbally and in writing.

They were given a helpline number at which they can call at any time, and their issues were sorted out by the operating surgeon. It is our established protocol to call our patients on the night of surgery and the next morning to ensure their well-being. On each call, patients or attendants were specifically inquired about the presence and intensity of symptoms like pain, bleeding, nausea, vomiting, blackout, or fall (due to sudden changes in blood pressure especially when they remove their compression garment in the first 48-72 hrs). A critical assessment of the need of hospital admission or emergency visit was made at each phone call.

Results

A total of 208 patients were included in this study. 120 (57.6%) were females, 88 (42.3%) were males (Table 2). The mean age was 40.23 years, weight 74.40 kg, BMI 28.9 kg/m^2, and mean lipoaspirate was 4.15 litres (Table 1). Procedures were done under different modes of anaesthesia, like general anaesthesia (59.1%), epidural (15.3%), and spinal (20.1%)(Table 2).

A very low percentage of patients had side effects like nausea (4.80%), vomiting (2.88%), pain (5.7%), bleeding from liposuction holes (11.05%), blackout (4.32%), and 0.96 % of our patients complained of fall. None of our patients required an emergency hospital visit after discharge(Table 3). Figure 1 compares the pre- and post-operative pictures of a representative case.

Table 1: *demographic and clinical variables of the patients.*

	Variable	Average	Minimum	Maximum
1	Age (years)	40.23	21	52
2	Weight (Kg)	74.40	58	80
3	Lipoaspiarte (liters)	4.15	1.2	5
4	BMI (Kg/m^2)	28.9	18.62	33.4

Table 2: *ASA scores and mode of anaesthesia of the patients.*

Variable	n	%
ASA Score		
I	178	85.5
II	30	14.4
Made of anesthesia		
GA	123	59.1
Epidural	32	15.3
Spinal	42	20.1

Table 3: *Complications*

	Variable	Total Number	Percentage
1	Nausea	10	4.80%
2	Vomiting	6	2.88%
3	Pain	12	5.76%
4	Bleeding	23	11.05%
5	Black Outs	9	4.32%
6	Fall	2	0.96%
7	Emergency Hospital Visit	0	0%

Figure 1: *Liposuction Before (above) and After (below)*

Discussion

Liposuction can be carried out very safely, but can we maintain the same safety index when we plan to do it in day-care units in a developing country? The results of our study substantiate that liposuction can be done as a day-care procedure but there are certain principles and protocols, which if not followed, may compromise the safety of the patient.[6]

Two things can essentially compromise patients; first is surgical errors, which may result due to inappropriate patient selection or any lapse in the execution of surgical technique.[8] The second is concern regarding anaesthesia safety in day-care surgery.[9] The minimum criteria for selecting patients for liposuction as a day-care surgery should be a stable medical and psychological status, and adequate social support system.

Regarding anaesthesia safety in ambulatory set-up, and type of anaesthesia to be chosen, the following factors must be taken into consideration during the decision-making process:

a. Difficult airway, morbid obesity, obstructive sleep apnoea
b. Abnormalities of major organ systems
c. Prior anaesthesia with any adverse experience (malignant hyperthermia).
d. Current medications, drugs, and allergies
e. History of alcohol or other substance abuse
f. Presence of a responsible adult who would accompany the patient back to home from the office

Anaesthetic techniques utilizing intravenous sedatives, hypnotics, and narcotics are extensively used in office-based surgery settings. When applied to liposuction procedures, clinical experience suggests an excellent safety margin.[10,11] Lidocaine has a higher safety index and can be more promptly reversed. Although the recommended dose of lidocaine is less than 7 mg/kg,[12,13,14] literature has established that it may be used in doses up to 55mg/kg as a tumescent solution.[15] Despite that, toxicity may occur when using such large doses.[16,17] Signs and symptoms of lidocaine toxicity include lightheadedness, restlessness, drowsiness, tinnitus, a metallic taste in the mouth, slurred speech, and peri-oral numbness. These signs appear at plasma levels between 3 and 6 µgram/ml. Trembling, muscle twitching and tremors are evident when plasma levels reach 5 to 9 µgram/ml.[16] Seizures, central nervous system depression, and coma follow at plasma levels greater than 10 µgram/ml. Above these levels, respiratory depression and cardiac arrest can occur.[18,19]

Although systemic toxicity remains the chief focus of concern, data suggests that neurologic injury and cardiac arrest were both more frequent than systemic toxic reaction.[20]

The recommended dose of epinephrine is 0.7 mg/kg, but higher doses have been used safely.[11]

In our study, no patient had any adverse effect from any mode of anaesthesia (general, epidural, or spinal). The use of general anaesthesia for liposuction has been a source of professional debate and there are unsubstantiated implications regarding its safety.[21,22] However, studies prove that general anaesthesia is safe and effective in an accredited office-based surgery facility.

Epidural anaesthesia coupled with the infusion of anaesthetic infiltrate offers consistent intraoperative comfort to the patients. Chloroprocaine, an anaesthetic agent, is often used as it rapidly metabolizes and has the lowest systemic toxicity risk amongst other local anaesthetic drugs. However, epidural anaesthesia can cause vasodilation and hypotension, which results in the administration of extra fluid and an increased risk of fluid overload.[23] Spinal anaesthesia is also deemed safe for day-care procedures. The risk of cardiac arrest with spinal anaesthesia appears to be 3 times higher than the risk of having a systemic toxic reaction with all regional techniques combined. Pollard concluded that the appa-

rent risk of cardiac arrest during spinal anaesthesia is approximately 7 for every 10,000 anesthetics.[24]

An important aspect of post-operative care is the assessment of phases of a patient's recovery that requires monitoring, state of co-morbidities of the patient, and optimal time for the safe discharge of the patient.[25] In our set-up, patients were accommodated in an amicable environment, where all facilities of post-operative care were provided. The accessibility to anaesthesiologist and surgeon was enacted beyond any doubt in times of necessity.

In a study conducted by Kaoutzanis et al, the most frequently reported post-operative complaint was nausea and vomiting (1.02%) which is comparable to our study, nausea 0.9% and vomiting 0.3%. And the most frequently reported major complication in their study was skin slough 0.0903%, none of our patients had this complication. In all, the rate of major complication rate is 0.2602%, these complications included contour irregularities, unplanned hospital admission, and prolonged swelling[7]. In our study, no patient required readmission for any reason substantiating the safety of liposuction.

Post liposuction compression garment is obligatory, patients were asked to wear a corset after liposuction as standard to maintain compression on the lipo-sculpted areas[26]. All patients were informed that in the initial 24-48 hours, brisk removal of this garment may result in a blackout due to sudden changes in blood pressure.[27] Although few encountered this symptom, it was uneventful.

Nausea and vomiting were tolerable and no patient required any intravenous medication for it. A few patients were concerned regarding bleeding from wounds, but all had serosanguinous fluid. They were reassured and directed to reinforce the dressing. None of our patients ever needed to visit the emergency unit after liposuction.

Conclusion

Daycare surgery is a safe option for liposuction. It can be done under any mode of anaesthesia (general, spinal, or epidural). Certain guidelines should be practiced to make it uneventful for both patient and surgeon.

Conflict of interest *None*

Funding Source *None*

References

1. Scuderi N, Paolini G, Grippaudo FR, Tenna S. (2000) Comparative evaluation of traditional, ultrasonic, and pneumatic assisted lipoplasty: Analysis of local and systemic effects, efficacy, and costs of these methods. Aesthetic Plast Surg.24:395–400.
2. Viterbo F, Ochoa JS. (2002) Vibroliposuction: a study of rate of aspiration. Aesthetic plastic surgery. 26(2): 118-22.
3. Hoyos A, Perez ME, Guarin DE, Montenegro A. (2018) A report of 736 high-definition lipoabdominoplasties performed in conjunction with circumferential VASER liposuction. Plastic and reconstructive surgery 142(3): 662-75.
4. Youn JI, Holcomb JD. (2013) Ablation efficiency and relative thermal confinement measurements using wavelengths 1,064, 1,320, and 1,444 nm for laser-assisted lipolysis. Lasers in medical science 28(2):519-27.
5. Duncan DI.(2013) Nonexcisional tissue tightening: creating skin surface area reduction during abdominal liposuction by adding radiofrequency heating. Aesthetic surgery journal 33(8):1154-66.
6. Osborne GA, Rudkin GE. (1993) Outcome after day-care surgery in a major teaching hospital. Anaesthesia and intensive care (6):822-7.
7. Kaoutzanis C, Gupta V, Winocour J, Layliev J, Ramirez R, Grotting JC, Higdon K. (2017) Cosmetic liposuction: preoperative risk factors, major complication rates, and safety of combined procedures. Aesthetic surgery journal. 37(6):680-94.
8. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Annals of surgery. 2008 Aug 1;248(2):189-98.
9. Mysore V. (2008)Tumescent liposuction: Standard guidelines of care. Indian J Dermatol Venereol Leprol; 74, Suppl S1:54-60
10. Bitar, G., Mullis, W., Jacobs, W., et al. (2003) Safety and efficacy of office-based surgery with monitored anesthesia care/sedation in 4778 consecutive plastic surgery procedures. Plast. Reconstr. Surg. 111: 150.
11. Marcus, J. R., Tyrone, J. W., Few, J. W., Fine, N. A., and Mustoe, T. A. (1999) Optimization of conscious sedation in plastic surgery. Plast. Reconstr. Surg. 104: 1338.
12. Rao, R. B., Ely, S. F., and Hoffman, R. S. (1999) Deaths related to liposuction. N. Engl. J. Med. 340: 1471.
13. Rubenstein, E. H. (1999) An anesthesiologist's perspective of lipoplasty. Clin. Plast. Surg. 26: 423.
14. Elkins-Sinn, Inc. (1990) Lidocaine (Package Insert). Cherry Hill, N.J.: Elkins-Sinn.
15. Ostad A, Kageyama N, Moy RL. (1996) Tumescent anesthesia with a lidocaine dose of 55 mg/kg is safe for liposuction. Dermatol Surg.22:921–927.
16. Hunstad, J. P. (1996) Body contouring in the obese patient. Clin. Plast. Surg. 23: 647.
17. Fodor, P. B. (1999) Wetting solutions in ultrasound-assisted lipoplasty. Clin. Plast. Surg. 26: 289.

18. Gingrass, M. K. (1999) Lipoplasty complications and their prevention. Clin. Plast. Surg. 26: 341.
19. Meister, F. (1996) Possible association between tumescent technique and life-threatening pulmonary complications. Clin. Plast. Surg. 23: 642.
20. Auroy Y, Narchi P, Messiah A, Litt L, Rouvier B, Samii K. (1997) Serious complications related to regional anesthesia: Results of a prospective survey in France. Anesthesiology 87:479-486
21. Bruner, J. G., and de Jong, R. H. (2001) Lipoplasty claims experience of U.S. insurance companies. Plast. Reconstr. Surg. 107: 1285.
22. Twersky, R. S. (2001) Update on office-based anesthesia: Caveats on the professional finger pointing. A.S.A. Newsletter 65: 17.
23. Knize, D. M., and Fishell, R. (1997) Use of perioperative subcutaneous "wetting solution" and epidural block anesthesia for liposuction in the office-based surgical suite. Plast. Reconstr. Surg. 100: 1867.
24. Pollard JB. (2001) Cardiac arrest during spinal anesthesia: common mechanisms and strategies for prevention. Anesth Analg 92:252-2
25. Arshad SM, Latif S, Altaf HN. A retrospective analysis of complications of large volume liposuction; local perspective from a third world country. Rawal Medical J. 2018 Jan 22;43(1):77-80.
26. Alam M, Anwar M. Skin shrinkage in Gynaecomastia with VASER Liposelection. Pakistan Journal of Plastic Surgery. 2016;4(3):14-8.
27. Park, J.Y. (2018). Cautions and Complications. In: Liposuction. Springer, Singapore. https://doi.org/ 10.1007/978-981-10-6860-7_2

Research Article

Utilization of First and Second Dorsal Metacarpal Artery Flaps for Reconstruction of Soft Tissue Defects of Thumb and First Webspace: Reproducible and Safe Options for Reconstruction

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Abstract

Background: Soft tissue reconstruction of thumb and first web-space requires robust and sensate flaps. First and second dorsal metacarpal artery flaps are excellent options for such cases. Variable survival and sensory restoration is reported due to different surgical techniques. We present our technique and outcome to help a novice surgeon safely and confidently utilize these flaps.

Methodology: This prospective case series was conducted from July 2017 to December 2019. Patients requiring thumb and first web space soft tissue reconstruction were included. Flap necrosis, hypertrophic scarring, two point discrimination and active range of motion were noted to assess outcome.

Results: A total of 17 patients were included, 11 (64.7%) underwent reconstruction with first dorsal metacarpal artery (FDMA) flap and 6 (35.3%) with second dorsal metacarpal artery (SDMA) flap. 7.7 ± 0.75 mm was the average two-point discrimination with FDMA flap and 8.0 ± 0.63mm with SDMA flap. 7 out of 11 (63.6%) developed sensory reorientation with FDMA flap and 2 (33.3%) out 6 with SDMA flap. Mean angle of donor index finger metacarpophalangeal joint (MCPJ) was 79.4° and 91.9° of proximal interphalangeal joint (PIPJ) when FDMA was utilized. Mean angle of index finger MCPJ was 80.2° and PIPJ 90.2,middle finger MCPJ was 81.7 and 98.5 at PIPJ when SDMA was utilized. Flap necrosis was not observed in any case.

Conclusion: First and second dorsal metacarpal artery flaps are sensate and robust options to reconstruct thumb and first web-space defects.

Received | 07-01-2023: **Revised** | 23-02-2023 **Accepted** | 26-02-2023

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Keywords | First dorsal metacarpal artery flap, Second dorsal metacarpal artery flap, Thumb reconstruction, first web space reconstruction.

Introduction

Thumb plays an important part in the functionality of hand. It has its independent specialized muscles and loss of thumb function results in loss of pinch grip and grasp.[1,2] For thumb to retain adequate function, it must have an adequate length, a reasonable range of motion and sensate stable coverage for tactile feedback needed for fine control.[3,4] Soft tissue of thumb requires special consideration, with each surface of thumb requiring tissue replacement with similar one.[4] First and second dorsal metacarpal artery flaps offer a durable and sensate option to reconstruct the thumb defects.[5,6,7,8] Although they are workhorse flaps for thumb soft tissue defects and first webspace reconstruction, a novice surgeon requires some surgical considerations to successfully plan and utilize them.[9] The degree of sensory restoration of the reconstructed area also varies, with many studies mentioning persistent cortical disorien-

tation.[10,11,12]

We present a case series describing the practical considerations and pitfalls when using these flaps for reconstruction of soft tissue defects of palmar surface of thumb and 1st webspace, based on our experience. We also present the outcome on the basis of wound healing and restoration of sensation. The objective is that our practical description may help a novice surgeon to safely utilize these flaps and relate the expected outcome to the patients in a confident manner.

Methodology

This study was conducted in Jinnah burn and reconstructive surgery center Lahore from July 2017 to Dec 2019. After obtaining permission from ethical review board, we included patients who required flap for reconstruction of soft tissue defects of the palmar surface of thumb and first webspace. Patients who required reconstruction of bony or tendon injuries, with extensive soft tissue defects requiring distant flaps were excluded. Patients with uncontrolled comorbid conditions were also excluded. All patients were assessed for suitability and were enrolled for the study after obtaining informed consent. Preoperatively planning in reverse was done, either first or second dorsal metacarpal artery flap was marked depending upon the dimensions and location of the defect. All perioperative data was recorded, and patient was followed post operatively. Flap necrosis was noted in immediate postoperative period. Sensation was evaluated at 6 months, by comparing static two-point discrimination to the contralateral normal side and determining sensory reorientation by patient's feedback. Hypertrophic scarring and active range of motion over index and middle finger metacarpophalangeal (MCPJ) and proximal interphalangeal joints (PIPJ) was also evaluated at 6 months.

Operative Technique:

All surgeries were performed in regional anesthesia or general anesthesia and under tourniquet control, applied after Esmarch maneuver. Loupe magnification of 2.5 x was used for entire procedure. Wound excision or release of contracture was done, and dimensions of the defect were noted. Flap was marked and planning in reverse was done. Post operatively scar care and active / passive range of motion was started in order to improve function of the hand.

Islanded First Dorsal Metacarpal Artery (FDMA) flap:

For first dorsal metacarpal artery flap doppler with 8 Mhz probe was used to mark 1st dorsal metacarpal artery at radial border of the 2nd metacarpal bone. Doppler signals are strong at its origin, at the base of first web space. Flap over proximal phalanx was marked, proximal to the first crease of proximal interphalangeal joint (PIPJ). The lateral markings were kept dorsal to the palmar / dorsal skin junction of the index finger. In case of thumb pulp defects, a v shaped skin extension was included in the skin island to incorporate it in the incision over interphalangeal joint (IPJ) of thumb. This prevented tightening of the tunnel over the interphalangeal joint (IPJ) as well as protected the small branches of the pedicle entering the flap at this level. An S-shaped incision was marked over the course of the first dorsal metacarpal artery.

Dissection of flap was started at distal and ulnar side, progressing proximally and radially, over the paratenon. Proximally over the dorsum of hand, S-shaped incision was given and thin skin flaps were raised on dermal plexus. The deep fascia was incised at the radial border of extensor digitorum communis (EDC) tendon of index finger and pedicle raised with a cuff of fascia around it. The first dorsal metacarpal artery branches have three terminal patterns and the ulnar most was taken with the flap, termed as FDMAu. The artery runs within the deep fascia of first dorsal interosseous, which was taken with the pedicle. Dissection over radial part of extensor hood was done with some part taken to preserve small terminal branches that supplied the flap. Dorsal branch of the digital nerve was divided and taken with the flap if flap was used to reconstruct pulp defects, where nerve was co-opted with digital nerve of the thumb. Proximal dissection was carried out till the origin of the pedicle.

A subcutaneous tunnel was created at the first web space and over the proximal phalanx of thumb, where skin was loose, but skin incision was given more distally, and v shaped skin extension of flap was incorporated to facilitate tension free closure. Full thickness skin graft (FTSG) from ulnar border of forearm was stitched over the donor site, reinforced with bolster. After insetting of flap, loose dressing was done and thumb was immobilized in 45° radial abduction and extension.

Islanded Second Dorsal metacarpal artery (2nd DMCA) flap:

Marking was done over the dorsum of first and second finger proximal phalanges not crossing the proximal crease of PIPJ and dorsal to the junction of palmar and dorsal skin, with the dimensions of the defect taken into

account. A lazy s incision was marked between second and third metacarpals to explore the second DMCA.

Incision was given over the dorsum of the hand. The skin flaps were raised on dermal plexus on radial and ulnar sides. Fascia was incised at the ulnar border of extensor indices proprius (EIP) tendon and radial border of EDC tendon of middle finger with division of the inter tendinous junction. The second dorsal digital nerve (DDN) and second DMCA travel within the deep fascia of second dorsal interosseous, which was raised together with a superficial vein to ensure adequate venous drainage. The skin paddles over phalanges were then raised as in the case of FDMA flap and pedicle was dissected over the extensor expansions and intermetacarpal ligament. We did not divide the tendon of index finger EDC and EIP and kept the pivot point before the pedicle entered deep to the tendons. In case the pivot point needed to be at the origin, there was the option of division of tendons and pedicle dissection proximally till the origin. Tunneling, flap in-setting and closure of the donor site was done as in the case of FDMA flap.

Results

A total of 17 patients were included, 9 (52.9 %) patients had post burn contractures or wounds and 8 (47.1%) presented with post traumatic wounds. In 11(64.7%) patients FDMA was used to reconstruct the defect whereas in 6 (35.3%) patients SDMA was used.

The mean two-point discrimination over the reconstructed site with FDMA flap was 7.7 ± 0.75 mm, compared to 3.64±0.50mm measured on the contralateral uninvolved side. In case of SDMA flap, the mean two-point discrimination was 8.0 ± 0.63mmas compared to 3.3 ± 0.52mm on the contralateral involved side.

Among the patients who underwent reconstruction with FDMA flap, 6 out of 8 (75%) developed sensory orientation in which nerve co-optation was done, while 1 out of 3 (33%) patients developed sensory reorientation without nerve co-optation. 2 out of 6 patients (33%) developed sensory reorientation who underwent reconstruction with SDMA flap. In this group, nerve co-optation was not performed on any patient.

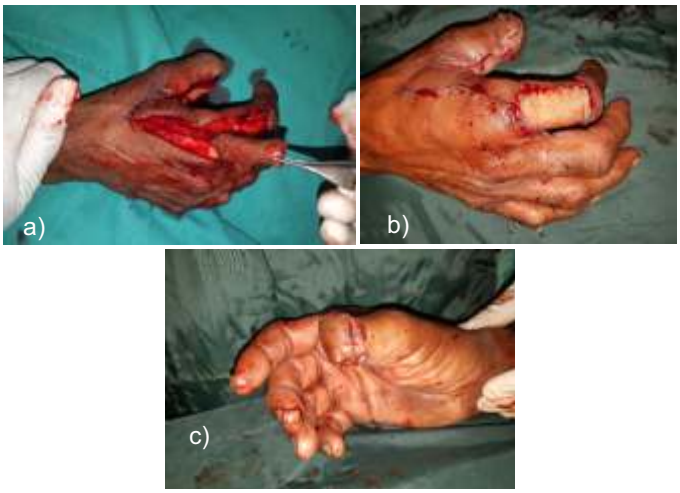
The mean angle of flexion of donor index finger MCPJ was 79.4° vs 81.6° of contralateral side when FDMA flap was used. In these patients, mean angle of flexion at PIPJ was 91.9° vs 94.5 °. In SDMA flap cases, the angle of flexion of index finger MCPJ was 80.2° and PIPJ was 90.2° as compared to 82.3 and 92.8 of the contralateral side. The mean angle of flexion of middle finger

Table 1: *Summary of findings noted in the study.*

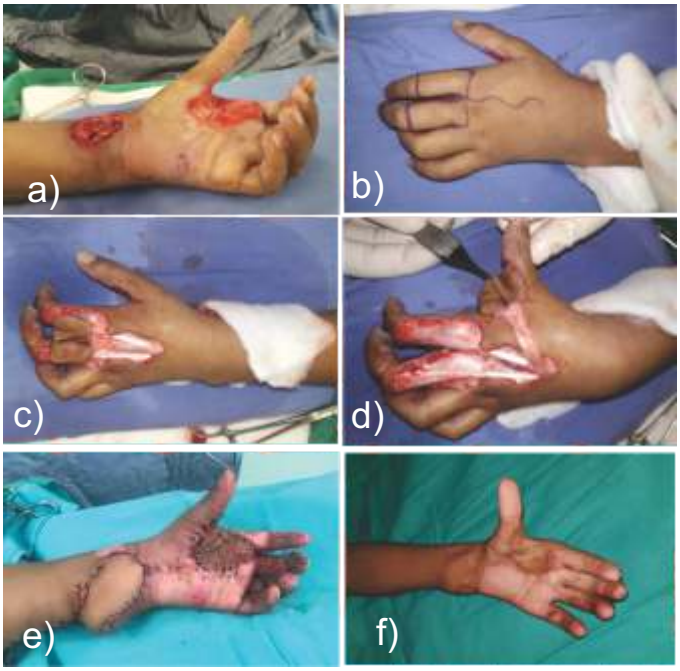
Gender	Age (Yrs)	Etiology	Soft tissue defect location	Flap	Flap Necrosis	Static two point discrimination flap (mm)	Static two point discrimination opposite side (mm)	Sensory reorientation
Male	20	Burn	First web	FDMA	None	8	4	Yes
Female	18	Burn	Dorsum of proximal phalanx	FDMA	None	9	4	No
Male	21	Burn	Defect over thenar eminence and 1st web	SDMA	None	7	3	Yes
Female	32	Burn	Pulp defect	FDMA	None	8	3	Yes
Male	37	Trauma	Pulp defect	FDMA	None	7	4	Yes
Male	30	Trauma	Amputation, stump at IPJ	FDMA	None	7	4	No
Male	13	Trauma	Amputation, stump at IPJ	FDMA	None	8	3	Yes
Male	47	Trauma	Pulp defect	FDMA	None	9	3	Yes
Female	20	Burn	First web	SDMA	None	9	3	No
Male	19	Burn	First web	SDMA	None	8	3	No
Male	29	Trauma	Pulp defect	FDMA	None	7	4	Yes
Female	25	Burn	First web	SDMA	None	8	3	No
Female	28	Trauma	Pulp defect	FDMA	None	7	4	Yes
Male	20	Burn	First web	SDMA	None	8	4	No
Female	15	Trauma	Amputation, stump at IPJ	FDMA	None	8	3	No
Female	23	Trauma	Defect over dorsum of MCPJ	FDMA	None	8	4	No
Male	11	Burn	First web	SDMA	None	8	4	Yes

account. A lazy s incision was marked between second and third metacarpals to explore the second DMCA.

Incision was given over the dorsum of the hand. The skin flaps were raised on dermal plexus on radial and ulnar sides. Fascia was incised at the ulnar border of extensor indices proprius (EIP) tendon and radial border of EDC tendon of middle finger with division of the



inter tendinous junction. The second dorsal digital nerve (DDN) and second DMCA travel within the deep fascia of second dorsal interosseous, which was raised together with a superficial vein to ensure adequate venous drain-



age. The skin paddles over phalanges were then raised as in the case of FDMA flap and pedicle was dissected over the extensor expansions and intermetacarpal ligament. We did not divide the tendon of index finger EDC and EIP and kept the pivot point before the pedicle entered deep to the tendons. In case the pivot point needed to be at the origin, there was the option of division of tendons and pedicle dissection proximally till the origin. Tunneling, flap in-setting and closure of the donor site was done as in the case of FDMA flap.

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Figure 1: *A 30-year-old male laborer presented with amputation at Interphalangeal joint (IPJ)(a). Defect was reconstructed with First Dorsal Metacarpal Artery Flap (FDMA)(b & c).*

Figure 2: *A 21-year-old male sustained low voltage electric current injury(a). Reconstruction of 1st web space and adjacent area over thenar eminence was done using SDMA flap(b, c, d). Rest of the wounds were skin grafted and covered with ulnar artery perforator flap(e,f).*

Discussion

Use of the dorsal skin over fingers has evolved over the years as being two staged pedicled flaps to single staged is landed flaps. The dorsal skin provides sensate and robust flaps to reconstruct the defects up to the pulp of the thumb.[8,13] The vascular bases are also constant enabling reproducible and good results to be achieved. They are also easier to raise as compared to other sensate flaps and do no need microsurgical expertise.[8,14] First dorsal metacarpal artery flap has been extensively used for the reconstruction of thumb soft tissue defects.[15] As pointed in some studies Venous congestion can be a problem with FDMA flaps, with incidence as high as 11%.[5] We noted that the distal part of tunnel was always narrow when flap was used to reconstruct the pulp of thumb defects hence a v shaped extension of flap was taken proximally and adjusted over an incision given over ulnar aspect of inter phalangeal joint to release the tension over the pedicle. A cuff of soft tissue with the pedicle also improved the venous drainage and accounted for improved flap success rate. The second dorsal metacarpal artery flap when raised as islanded flap, with a cuff of soft tissue along the pedicle, but was used to reconstruct first web space and soft tissue defects of thenar eminence. The bi-paddle flap offered large skin islands to reconstruct two adjacent surfaces at first web space as pointed out by other authors.[7,8]

Scar complications were observed in one case only despite adequate post operative care. Post-operative loss in range of motion was also negligible due to the above-mentioned post-operative care, in addition to sparing of the skin over joints and raising islanded flaps. We observed increased incidence of sensory reorientation in FDMA flaps where nerve was coopted with the digital nerve of thumb. The increased incidence, i.e 63.6% as compared to less than 50% incidence, was maybe due to the nerve cooptation or because most studies failed to mention whether nerve cooptation was performed or not. Nevertheless, reorientation never affected the day-to-day function of the reconstructed thumb.[16,10] Feng et al have demonstrated that the division of superficial radial nerve and coaptation with sensory nerves at the recipient site improved two-point discrimination and sensory reorientation. But the transection of nerve which is in proximity with the vascular pedicle is a risky option, when compared to a little benefit when nerve is not transected. Nerve co-optation for SDMA is neither described nor have we attempted, as its reach is till the base of the thumb and first web space.

Our study clearly shows the advantage of neural co-optation, but due to a smaller number of cases, a comparative study is needed to further emphasize the advantage of neural co-optation. This technique can be further explored in case of SDMA flap to evaluate the advantage in reconstructing the working surface of thumb. We further recommend research comparing these flaps with other flaps e.g., free toe pulp transfer over a longer follow up period to ascertain the pros and cons of each method of reconstruction.[17]

Conclusion

Sensate Flaps based on dorsal metacarpal arteries offer robust tissues to reconstruct the soft tissue defects and restore sensation of thumb. Increased flap success rate together with minimal donor site morbidity can be achieved through meticulous technique and good post-operative care.

Conflict of interest *None*

Funding Source *None*

References

1. Chu-Santos CAR, Handog PGB. Thumb opposition strength in healthy adults- a baseline study. Acta Scientific Orthopaedics.2021;4(6): 90-9.
2. Garg B, Manhas V, Vardhan A, Srivastava DN, Das CJ, Vibha D et al. Thumb opposition recovery following surgery for severe carpal tunnel syndrome: aclinical, radiological, and electrophysiological pilot study. J Hand Surg Am. 2019 ;44(2):157.e1-157.e5.
3. YushaL, Erin AM, Corinne EW, Adnan P, Danielle JE, Dennis SK. Osteoplastic thumb reconstruction in the immediate setting: acase series. PlastReconstr Surg-Glob Open.2022; 10(6):p e4385.
4. Yang K, Zhao Z, Pan Y,Song F, Deng J, Zhu J. Resorption of iliac bone grafts following wrap-around flap for thumb reconstruction: a follow-up study. J Hand Surg. 2020;45;64.e1–4.e8.

Research Article

The CV Flap for Nipple Reconstruction: Short Term Outcomes and Patient Satisfaction

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Abstract

Background: Due to an increased incidence of breast cancer in younger patients, breast reconstruction after mastectomy is now an emerging super specialty in Pakistan. Nipple and areola needs to be reconstructed as a completion procedure after creation of an aesthetically pleasing breast mound.

Methodology: It was a prospective cohort study which was conducted at PGMI/ AMC/ Lahore General Hospital, Lahore for duration of one year. Standard CV flaps were used in all cases. Flap survival and complications were observed. The projection of the nipple was measured in all cases. The patient satisfaction was scored using Visual Analogue scale.

Results: We have done 10 cases of Nipple Reconstruction with CV flap in breast reconstruction and burn breast cases. The nipple projection was 10.2mm on average. No major complication was observed. All patients were satisfied with an average of 9 at 1-10 scale.

Conclusion: The nipple reconstruction with the CV flaps is simple and reliable technique with high satisfaction rates in patients of breast reconstruction.

Received | 20-01-2023: **Accepted** | 28-02-2023
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Keywords | Nipple reconstruction, CVFlap, Breast reconstruction.

Introduction

Nipple reconstruction is part and parcel of breast reconstruction.[1] The Breast reconstruction after cancer, post burn breast contractures with burnt out nipple areola complex and massive gigantomastia are few types of cases where we deal for the nipple reconstruction. Nipple reconstruction can be done by various methods.[2,3,4] Nipple reconstruction with or without are olar tattooing is the final and defining feature of the female breast.[5] Improved physiological well-being and improved patient satisfaction has been reported in cases where timely reconstruction of NAC was considered.[6,7]

The aim of reconstructing the neo-nipple is creation of an aesthetically pleasing nipple bud which is symmetrical to contralateral nipple with minimal scarring and donor site morbidity. A number of reconstructive procedures have been described in the literature which itself reveals the fact that not even a single reconstructive procedure has been able to achieve the desired outcome from the surgeon's as well as the patient's perspective. However, the evidence regarding an increase in the use of local flaps for the neo-nipple creation reveals that this is the favored modality in terms of ease of technique and long terms outcomes.[8]

The selection of technique for nipple reconstruction usually depends on the individual experience of the surgeon and choice of the patient.[8] Nipple can be reconstructed using different reconstructive modalities, the grafts, local flaps, combination of flap and grafts, cartilage grafts, Alloderm, fillers, bone cement, silicone and other materials have been reported in the literature.[2] 3D tattoos for nipple and areola or combination of flaps for nipple and tattoo for areola[3] and artificial nipples are also used to camouflage deformities.

The longevity of the procedure in terms of maintenance of projection of neo-nipple is the single most important factor in determining the success of the selected procedure and patient satisfaction. There are multiple factors which affect the long term outcome of NAC reconstruction e.g. the type of reconstruction (autologous versus implant based reconstruction), patient tendency towards hypertrophic scarring leading to scar contracture, history of previous radiotherapy.[8] The technical factors such as poor selection of technique, inappropriate flap design that compromises the circulation leading to delayed healing and infection also can affect the longevity of reconstruction.

Local flaps have multiple advantages. Being autologous; it replaces the like with the like, is cost effective (All odermor fillers are expensive) and unlike artificial nipples they are part of body and gives a feeling of self. There are multiple flaps available to reconstructa nipple[1,2] from simpler to complex. The CV flap, skateflap,[9] star,[10] double opposing tab flap[11,12] double opposing V-Y flap and V-Y advancement flap,[2] have all been reported in the literature with variable success.

We have chosen CV flap for nipple reconstruction in all of our cases. The author feels that it is simple, reproducible, and gives good projection of the nipple as it involves complete elevation of the C and V flaps which are then folded over each other while maintaining the vascularity at the base of the flap. The closure of the donor site at first followed by flaps insetting further helps to maintain the nipple projection.

Methodology

It was a prospective cohort study which was conducted at Lahore General Hospital between June 2018 to May 2019. We used the non-probability convenience sampling technique for data collection. All cases were done by the senior author. Each nipple reconstruction was done with flap based reconstruction using a CV flap.

The procedure was done under local anesthesia as day case procedure. At the day of surgery, the patient was advised to come with the proposed site of nipple are olar complex marked by herself while standing in front of a mirror. Normal side of nipple projection was measured and opposite side was marked for CV flap. The flap was raised including five to seven millimeters of subcutaneous tissue along with the flap(depending upon the contralateral nipple diameter and projection). The donor site was first closed with 5/0 monocryl followed by insetting of V flaps and C flap using 5/0 monocryl sutures. Steri strips were applied followed by the dry gauze and water proof non-crushing dressing with a window so that the viability of the reconstructed nipple could be monitored. The patient went home the same day. Follow up was carried out at seven and fifteen days, three weeks and six weeks postoperatively. Early postoperative complications like infection, wound dehiscence, partial or total flap necrosis were recorded.

The end point of follow up for this study was the complete wound healing and assessment of nipple projection at three and six weeks. Subjective assessment was done using the Visual analog scale. Patients were asked to scale satisfaction with the procedure ranging from 1-10 with 1-3 counted as poor satisfaction, 4-6 as satisfactory and 7-10 as high satisfaction and willing to recommend this procedure to others).

Objective assessment was done by measuring the height and diameter of reconstructed nipple with the help of Vernier caliper. We kept a record of nipple projec-tion by repeated follow up at three months, six months and then yearly for five years after the nipple reconstruction to evaluate the long term outcome of the procedure.

Results

Ten cases (n=10) underwent nipple reconstruction with CV flap in our department during study period. Six (60% n=6) out of ten patients had undergone autologous breast reconstruction with extended LAD. One 10% (n=1) patient had implant based breast reconstruction (sub muscular), and three patients 30%(n=3) were cases of post burn breast contracture release and split thickness skin grafting, followed by a nipple reconstruction. (Table 1). All of the ten 100% (n=10) Nipple reconstructions with CV flap had uneventful recovery. All of the ten (100% n=10) flaps survived. Even in the three cases of post burn breast contractures, where resurfacing was done with split thickness skingrafts, the flap survival was hundred percent. Minor wound complications like partial necrosis, infection leading to wound dehiscence was not observed in any of the cases. Inflammation at week six was found in one case 10% (n=1) and itching in one 10% (n=1) case. One case with nipple projection loss was found at week six 10%(n=1). Table 1 Nipple projection at the end of three to six weeks was measured and ranged from 6.5 mm to12mm with an average of 10.2 mm. Patients were asked to rate their satisfaction according to visual analogue scale mentioned previously. Nine out of ten rated as high (90% n=9) and one rated it as good 10% (n=1). Figure 1 to 5 demonstrate the technique on a representative patients.

The patient satisfaction by Visual Analog scale ranged from 6 to10 with an average of 9.

Table 1: *Type of Breast Reconstruction*

	Cases (n)	Percentage
Autologous Reconstruction with extended LADflap	6	60%
Post burn breast contracture Release and Skin Grafted	3	30%
Implant based breast reconstruction(submuscular)	1	10%
Total number of cases(n)	10	

Table 2: *Complications withCVflap*

No of patients with complication(n)		Percentage
Inflammation/redness	1	10%
Itching	1	10%
Partial flap loss	0	0%
Total flap loss	0	0%
Loss of projection	1	10%
Total number of complications in patients	3	30%

Table 3: *Visualanalogue scale scoring for results*

Number of patients (n)		Percentage of patients
High satisfaction(7-10)	9	90%
Good(4-6)	1	10%
Poor(1-3)	0	0%
Total number of patients(n)	10	

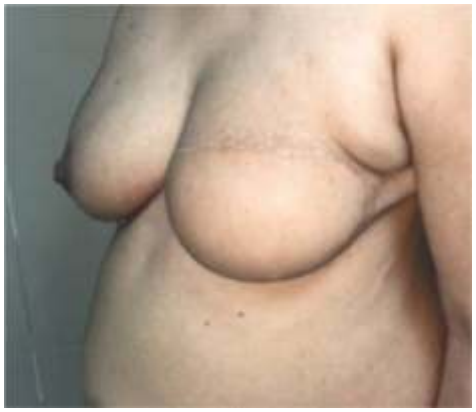

Figure: 1 : *Pre- op Oblique view*

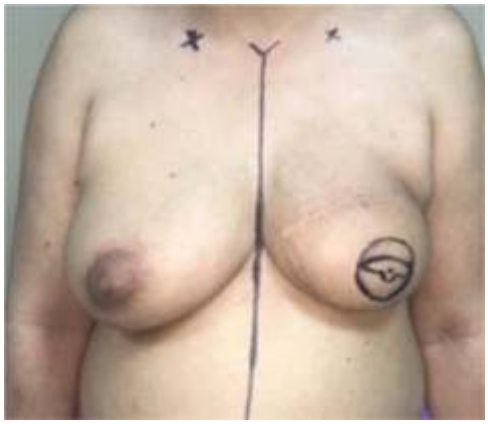

Figure: 2: *Pre-op frontal View with Marking*

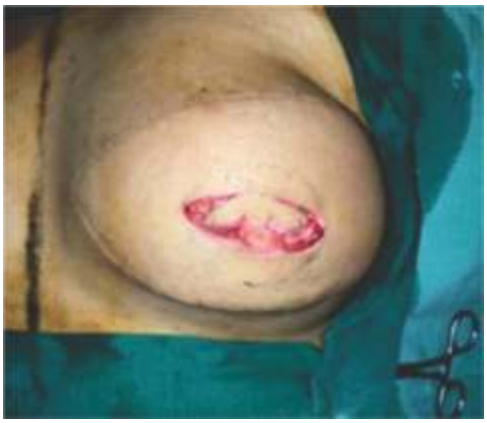

Figure 3: *Per op Frontal view*

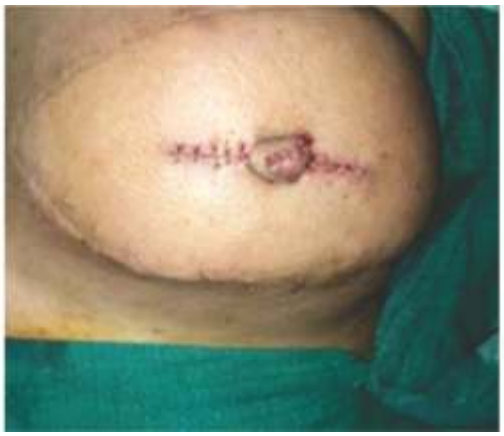

Figure 4: *Post op frontal view*

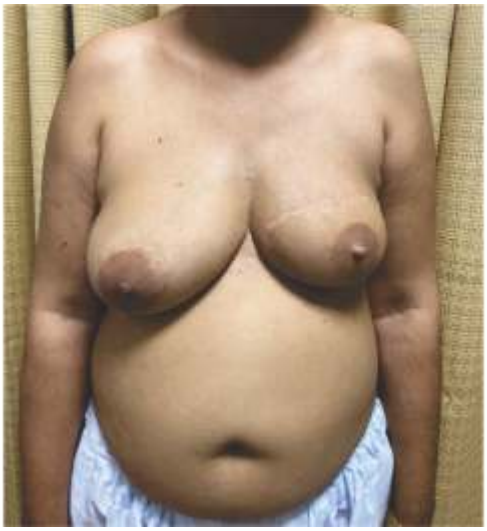

Figure 5: *post of frontal view*

Discussion

The CV flap has been shown to produce good results since its introduction in 1998 with the rates of patient satisfaction ranging from low to high.[13,14] In our study, we report high rates of satisfaction in short term follow up of three to six weeks. Majority of patients reported improved psychological well-being and greater patient satisfaction. Nipple reconstruction was also regarded

as sense of completeness of their body image in almost all of the patients.

We have not encountered complications like wound dehiscence, partial or total flap necrosis. Inflammation with erythema was recorded in one patient which was settled with oral antibiotics without further delaying wound healing,[15] also reported lower rats of wound infection of 0.8percent.

In our study, one out of ten patients had implant based reconstruction. The nipple projection in this case was 6.5 mm at the end of three weeks which was lower than all the other cases which had elegantly maintained the nipple projection at the end of three weeks.

The high rate of satisfaction in all cases depicts the impact of nipple reconstruction on psychological wellness of the patient.[16] Because in the case of nipple reconstruction in implant based breast reconstruction, the author was not satisfied with the outcome but the patient still scored[6] in visual analog scale.

Conclusion

The nipple reconstruction with the CV flap is a simple and reliable and reproducible technique with the short learning curve. However, the projection of nipple was better in autologous reconstruction as compared to implant based reconstruction. Furthermore, the technique has shown good results in post burn breast cases where the skin grafts with subcutaneous tissue were used to create the flaps.

Conflict of interest *None*

Funding Source *None*

References

1. Little JW. Nipple-areola reconstruction. Clin Plast Surg. 1984;11(2): 351-64.
2. Nimboriboonporn A, Chuthapisith S. Nipple-areola complex reconstruction. Gland Surg. 2014; 3(1): 35–42.
3. Komiya T, Iwahira Y. A New Local Flap Nipple Reconstruction Technique Using Dermal Bridge and Preoperatively Designed Tattoo. Plast Reconstr Surg Glob Open.2017; 5(4):e1264.
4. He J, Wang T, Xu H, Zhang Y, Dong J. Immediate two-stage nipple reconstructionwith a local mastectomy flap following secondary autologous breast reconstruction. JPlast Reconstr Aesthet Surg. 2016; 69(2):206-10.
5. Few JW, Marcus JR, Casas LA, Aitken ME, Redding J. Long-term predictable nipple projection following reconstruction. Plast Reconstr Surg. 1999; 104(5): 1321–4.
6. Jabor MA, Shayani P, Collins DR Jr, Karas T, Cohen BE. Nipple-areola reconstruction: satisfaction and clinical determinants. PlastReconstr Surg. 2002; 110(2): 457–63.
7. WellischDK, SchainWS, NooneRB, LittleJW 3rd. The psychological contribution of nipple addition in breast reconstruction. Plast Reconstr Surg. 1987; 80(5): 699–704.
8. L Jalini, Lund J, Kurup V. Nipple Reconstruction Using the C-V Flap Technique: Long Term Outcomes and Patient Satisfaction. World J Plast Surg. 2017; 6(1): 68-73.
9. Zhong T, Antony A, Cordeiro P. Surgical outcomes and nipple projection using the modified skate flap for nipple-areolar reconstruction in a series of 422 implant reconstructions. Ann Plast Surg.2009; 62(5):591–5.
10. Gurunluoglu R, Shafighi M, Williams SA, KimmGE. In corporation of a preexisting scarin the star-flap technique for nipple reconstruction. Ann Plast Surg. 2012;68(1):17–21.
11. Kroll SS. Nipple reconstruction with the double-opposing tab flap. Plast Reconstr Surg. 1999; 104(2): 511–4.
12. KrollSS, ReeceGP, MillerMJ, EvansGR, RobbGL, Baldwin BJ, et al. Comparison of nipple projection with the modified double-opposing tab and star flaps. Plast Reconstr Surg.1997;99(6):1602–5.
13. Losken A, Mackay GJ, Bostwick J 3rd. Nipple reconstruction using the C-V flap technique: along-terme valuation. Plast Reconstr Surg. 2001;108(2):361–9.
14. El-Ali K, Dalal M, Kat CC. Modified C-V flap for nipple reconstruction: our results in 50patients. Jplast Reconstr AesthetSurg. 2009;62(8):991–6.
15. Otterburn DM, Sikora KE, Losken A. An outcome evaluation following post mastectomy nipple reconstruction using the C-V flap technique. Ann Plast Surg. 2010; 64(5):574–8.
16. Sisti A, Grimaldi L, Tassinari J, Cuomo R, Fortezza L, Bocchiotti MA, et al. Nipple Areola Complex ReconstructionTechnique:ALiteratureReview.EJSO2016; 42(4):441-65.

Research Article

Our experience of the Free Functioning Gracilis Muscle Transfer for Elbow Flexion in Brachial Plexus Injuries

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Abstract

Background: Brachial plexus injuries(BPI) are common in both blunt and penetrating trauma and can result in severe functional upper extremity deficits. Surgical reconstruction of these injuries is complex and often follows a stepladder pattern. Shoulder abductor and elbow flexor re-innervation involves both nerve repair and transfer techniques, which usually give reliable results only with early intervention. If the patients present late, however, or if there is no nerve to transfer or repair (as seen in root avusions), the only remaining option is transfer of a free functioning muscle neurotized by extra-plexal motor nerves to restore function. Freegracilis muscle transfer provides consistent elbow function in such cases, or in situations where previous nerve grafting and/or nerve transfer have produced disappointing results. The objective of this study is to share our experience of the free functioning gracilis muscle transfer in restoring elbow flexion.

Methodology: This retrospective study was done over a period of 4 years, by reviewing the records of all patients who underwent free functioning gracilis muscle transfer for restoration of elbow flexion in long-standing brachial plexus injuries. Functional outcomes were assessed clinically through MRC grading system and active range of motion (AROM) at the elbow joint was measured with goniometer. Patients were assessed at the 12 months of follow-up.

Result: Total number of patients with successful FFMTs were 21. According to MRC grading system 16 out of 21 (76%) patients were able to achieve power of M3 and above. AROM was <45° in 5 patients, 45° - 90° in 10 patients, and >90° in 6 patients. One patient was able to lift 2 kg weight as well.

Conclusion: Gracilis FFMT is a reliable procedure to restore elbow flexion in patients with brachial plexus injury in which there has been a delay in surgical intervention.

Received | 23-04-2023 **Revised** | 07-02-2023 **Accepted** | 23-2-2023
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Keywords | Brachial plexus injury, Gracilis, Free functional muscle transfer.

Introduction

Brachial plexus injuries cause functional impairments of the upper extremity that range from mild weakness to total paralysis.[1,2] Recent advances in the field of microsurgery have provided valuable developments in reconstructive options after brachial plexus injury.[3,4,5] Re-innervation of the biceps and shoulder musculature, by either nerve repair or nerve transfer techniques, brings about effective restoration of flexion of the elbow and abduction of the shoulder when perfor-med early (3 to 6 months after trauma).[6,7,8] If the patient presents more than 6 months after injury, nerve transfer techniques can still achieve satisfactory results. In partial injuries donor nerves may be from within the plexus, whereas in pan-plexus injuries, nerves outside the plexus must be used as donor

nerves.[10]

With further delays in presentation, exceeding 9-12 months after injury, attempts at restoring function by nerve repair or transfer are generally unsuccessful. Also, in cases of complete root avulsions, reconstructive options are limited, and multiple functions need to be restored. This has led to the use of free functioning muscle transfers (FFMTs) combined with extra-plexal motor nerves to re-establish function in such situations.[11,12] Free functioning muscle transfer can produce satisfactory elbow flexion in such cases and following unsuccessful nerve procedures, or in cases unsuitable for tendon transfers.[13] Doi, et al[11,13] described a procedure involving two FFMTs, one for elbow flexion and finger extension and the other for finger flexion. This provides a means of restoring basic hand function in delayed pan plexus injuries.[14]

With meticulous technique and consistent follow-up with regular physiotherapy, FFMT provides restoration of adequate elbow flexion. In this study, we describe the functional results of gracilis FFMTs for restoration of elbow flexion after brachial plexus injuries at our institute.

Methodology

This was a retrospective study done at Liaqat national hospital over a 4-year period from march 2015 till Feb 2019. The records of all patient with brachial plexus injuries who underwent free functional muscle transfer (FFMT) of the gracilis muscle were reviewed. Patients of all ages and due to any cause of brachial plexus injury were included in the study. Patients whose follow-up was less than 12 months and those who required an ancillary procedure to reinforce elbow flexion were not included in this study.

Functional outcome was assessed after completing 12 months of follow-up, on two parameters: power of elbow flexion and active range of motion at elbow. The Medical Research Council (MRC) grading system was used for evaluation of the power of elbow flexion and categorized as excellent (Grade M5), good (Grade M4), fair (Grade M3), and poor (Grade <M2).Active range of motion (AROM) at the elbow joint, measured with a goniometer, was categorized as excellent (>90º and able to lift 2 kg weight), good (>90º without weight), fair (45º - 90º), and poor (<45º).

Surgical technique:

A two team approach was used, where one team harvested the gracilis muscle flap from the contralateral thigh and the second team prepared the recipient site. The gracilis muscle was marked at 5cm intervals with methylene blue while in situ. It was then harvested with its dominant vascular pedicle (ascending branch of the medial circumflex femoral artery and its accompanying venae comitantes,) and its nerve, the anterior branch of the obturator nerve. The muscle flap was in set at the recipient site and its length and tension adjusted by using the 5cm interval marks as guides. During inset the elbow was positioned in 45° of flexion, the forearm was positioned in supination, and the wrist, metacar-pophalangeal joints (MCPJs) and interphalangeal joints (IPJs) were kept in a neutral position. The gracilis muscle was then attached proximally to the second rib or the acromion process, tunneled through the flexor compartment of the upper arm, passed under the brachio-radialis muscle and sutured distally to the extensor digitorum communis (EDC) and extensor pollicis longus (EPL) tendons. The nerve to gracilis was coapted to the intercostal nerves and the vascular pedicle was anasto-mosed to the thoracoacromial artery and vein.

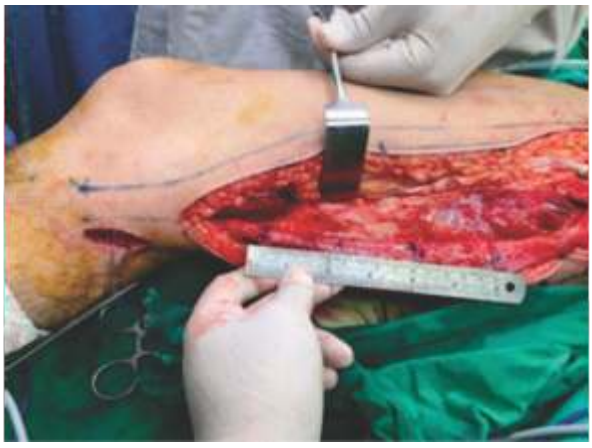

Figure 1. *Gracilis Muscle Marked In-situ at 5cm Interval*

Results

From January 2015 to December 2019, we performed free functioning gracilis muscle transfer to restore elbow flexion in 26 male patients with post-traumatic brachial plexus injuries. The mean age was 27.5 years (range 18-37) and the mean duration since injury was 42 months (range 14-153). The dominant limb was involved in 15 cases. The mechanisms of injury were road traffic accidents (RTA) in 19 and firearm injuries (FAI) in 7 cases.

5 out of 26 flaps (19%) failed due to vascular compro-

mise. Out of the 21 successful gracilis FFMT, 2 patients did not achieve any flexion at the elbow joint, and were graded as M0, one had power of M1 with mild flickering, two patients achieved power M2. Ten patients were able to achieve elbow flexion against gravity and were graded as M3. Finally, good restoration of elbow flexion was seen in 6 patients with power equivalent to M4. None of the patients achieved gradeM5 (Figure 1).

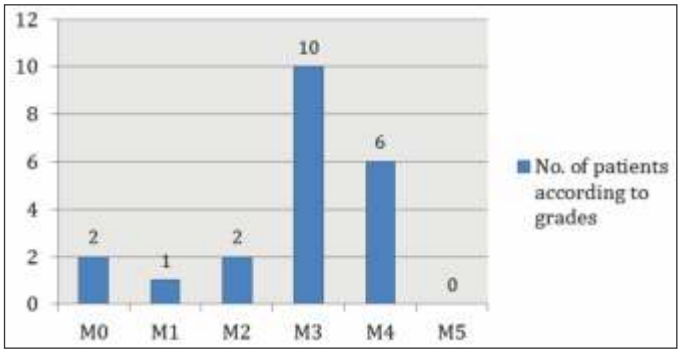

Figure 2: Patient Distribution according to MRC Grade Achieved

AROM with elbow flexion of <45°was seen in 5 patients, and in 10 patients it was noted to be 45°-90°. 5 patients were able to achieve elbow flexion with AROM >90°, but were unable to lift a 2 Kg weight, and 1 patient was able to flex his elbow with AROM >90°and was able lift a 2 Kg weight (figure 2).

There were minimal donor site complications. One patient developed a seromaat the donor site. None of the patients developed pneumothorax during intercostal nerve harvesting.

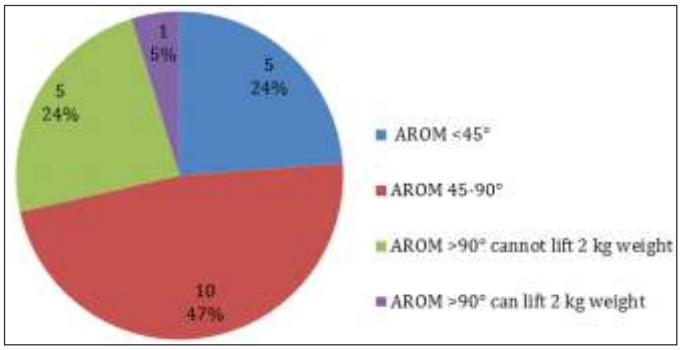

Figure 3: *Distribution of Patients according to AROM Achieved*

Discussion

Traumatic brachial plexus injuries can cause debilitating loss of upper limb function. Restoration of function in such cases requires complex surgical reconstruction. With modern surgical techniques, flexion at the elbow and stability of the shoulder can be significantly restored, if prompt surgical intervention is done[15,16]. In patients with lower plexus root avulsion injuries, nerve transfers and tendon transfers can restore basic functions of hand such as grasping. In long-standing pan-plexus injuries, however, micro-vascular free tissue transfer to the affected arm is the mainstay of the reconstructive surgical plan. Successful results depend not just on the nature of the plexus injury (site, mechanism, and time since injury) and associated trauma, but all soon surgical skills, operative time limitations, and postoperative rehabilitation.

Brachial plexus injuries can be differentiated into preganglionic injuries that involve avulsion of roots, and postganglionic injuries that are distal to the dorsal root ganglia. This distinction is essential for planning the appropriate reconstructive procedure. Postganglionic lesions can be managed by nerve repair and by neurotization or nerve transfer techniques from donor nerves available in the plexus or outside the plexus.[17,18] Injuries of the brachial plexus in which the nerve roots are avulsed (preganglionic lesions) are practically impossible to repair. Neurotization of important muscles from the nerves outside the plexus or FFMTs are the only available options.[7] When surgical intervention is carried out early, neurotization of the biceps muscle directly by the intercostal nerves can restore elbow flexion. Gracilis FFMT is recommended when there is avulsion of nerve roots, and the treatment is delayed by more than 9 to 12 months[13].

One of the major difficulties in rehabilitation of brachial plexus injuries is the limited availability of donor motor nerves for neurotization. Commonly used donor nerves to reestablish upper extremity function are the intercostal nerves and spinal accessory nerves, but no consensus currently exists as to which motor nerves are the best donors.[19,20] Restoration of function in patients who present with a flail limb is challenging. Prolonged denervation causes fibrosis and atrophy of the muscles, and direct neurotization is not possible. The only option available to restore function is FFMT with extraplexal neurotization. The main advantage of FFMT is that it provides prehensile function. Doi et all[13] and others have demonstrated successful restoration of prehension by performing FFMT only, and simultaneous restoration of two functions by one free muscle transfer. Neurotization of the gracilis muscle attached to clavicle by the second and third intercostal nerves can produce elbow flexion and finger or wrist extension while the second transfer, attached to the second or third rib and neurotized by the fourth and fifth intercostal motor nerves, produces finger flexion. Additionally, intercostal nerves can be used for triceps function and sensory innervation of the hand, producing independent flexion and extension

of the elbow and function of the hand. The expectations of the patients about functional outcome should be realistic, and they should be counseled regarding extensive post-operative rehabilitation before undergoing surgery. Patients may opt for a single procedure that produces elbow flexion, instead of two-staged procedures such as the double FFMT.

In this study, we performed gracilis FFMTs to achieve elbow flexion in brachial plexus injury patients in whom the time from injury to surgical intervention was more than 12 months and in patients who opted for restoration of the prehensile function of hand. Our experience provides additional support for the use of gracilis FFMTs as an option for reconstruction in above-mentioned scenarios.

Conclusion

Gracilis FFMT can reliably restore the elbow flexion in patients with delayed presentation of brachial plexus injuries, with an acceptable muscle power grade and active range of motion at the elbow joint.

Conflict of interest *None*

Funding Source *None*

References

1. Jain, Darshan Kumar A., Praveen Bhardwaj, Hari Venkataramani, and S. Raja Sabapathy. An epidemiological study of traumatic brachial plexus injury patients treated at an Indian centre. Indian Journal of Plastic Surgery 45, no. 03 (2012): 498-503.
2. Rankine JJ. Adult traumatic brachial plexus injury. Clinical radiology. 2004 Sep 1;59(9):767-74.
3. Dodakundi, Chaitanya, Kazuteru Doi, Yasunori Hattori, Soutetsu Sakamoto, Yuki Fujihara, Takehiko Takagi, and Makoto Fukuda. "Outcome of surgical reconstruction after traumatic total brachial plexus palsy." JBJS 95, no. 16 (2013): 1505-1512.
4. Maldonado, Andrés A., Allen T. Bishop, Robert J. Spinner, and Alexander Y. Shin. "Five operations that give the best results after brachial plexus injury." Plastic and Reconstructive Surgery 140, no. 3 (2017): 545-556.
5. Limthongthang, Roongsak, Abdo Bachoura, Panupan Songcharoen, and A. Lee Osterman. "Adult brachial plexus injury: evaluation and management." Orthopedic Clinics 44, no. 4 (2013): 591-603.
6. Noaman, Hassan Hamdy, Anis Elsayed Shiha, and Jörg Bahm. "Oberlin's ulnar nerve transfer to the biceps motor nerve in obstetric brachial plexus palsy: indications, and good and bad results." Microsurgery 24, no. 3 (2004): 182-187.
7. Oberlin, C., D. Beal, S. Leech avengvongs, A. Salon, M. C. Dauge, and J. J. Sarcy. "Nerve transfer to biceps muscle using a part of ulnar nerve for C5–C6 avulsion of the brachial plexus: anatomical study and report of four cases." The Journal of hand surgery 19, no. 2 (1994): 232-237.
8. Ali, Zarina S., Gregory G. Heuer, Ryan WF Faught, Shriya H. Kaneriya, Umar A. Sheikh, Idrees S. Syed, Sherman C. Stein, and Eric L. Zager. "Upper brachial plexus injury in adults: comparative effectiveness of different repair techniques." Journal of neurosurgery 122, no. 1 (2015): 195-201.
9. Martin, Enrico, Joeky T. Senders, Aislyn C. DiRisio, Timothy R. Smith, and Marike LD Broekman. "Timing of surgery in traumatic brachial plexus injury: a systematic review." Journal of neurosurgery 130, no. 4 (2018): 1333-1345.
10. Birch, R. "Timing of surgical reconstruction for closed traumatic injury to the supraclavicular brachial plexus." Journal of Hand Surgery (European Volume) 40, no. 6 (2015): 562-567.
11. Barrie, Kimberly A., Scott P. Steinmann, Alexander Y. Shin, Robert J. Spinner, and Allen T. Bishop. "Gracilis free muscle transfer for restoration of function after complete brachial plexus avulsion." Neurosurgical focus 16, no. 5 (2004): 1-9.
12. Maldonado, Andrés A., Michelle F. Kircher, Robert J. Spinner, Allen T. Bishop, and Alexander Y. Shin. "Free functioning gracilis muscle transfer with and without simultaneous intercostal nerve transfer to musculocutaneous nerve for restoration of elbow flexion after traumatic adult brachial pan-plexus injury." The Journal of Hand Surgery 42, no. 4 (2017): 293-e1.
13. Ahmad IAddosooki, Kazuteru Doi, and Yasunori Hattori. "Technique of harvesting the gracilis for free functioning muscle transplantation." Techniques in Hand & Upper Extremity Surgery 10, no. 4 (2006): 245-251.
14. Carlsen, Brian T., Allen T. Bishop, and Alexander Y. Shin. "Late reconstruction for brachial plexus injury." Neurosurgery Clinics of North America 20, no. 1 (2009): 51-64.
15. Martin, Enrico, Joeky T. Senders, Aislyn C. DiRisio, Timothy R. Smith, and Marike LD Broekman. "Timing of surgery in traumatic brachial plexus injury: a systematic review." Journal of neurosurgery 130, no. 4 (2018): 1333-1345.
16. Birch, R. "Timing of surgical reconstruction for closed traumatic injury to the supraclavicular brachial plexus." Journal of Hand Surgery (European Volume) 40, no. 6 (2015): 562-567

17. Yang, Lynda J-S., Kate W-C. Chang, and Kevin C. Chung. "A systematic review of nerve transfer and nerve repair for the treatment of adult upper brachial plexus injury." Neurosurgery 71, no. 2 (2012): 417-429.
18. Zhang, Cheng-Gang, Zhen Dong, and Yu-Dong Gu. "Restoration of hand function in C7–T1 brachial plexus palsies using a staged approach with nerve and tendon transfer: Report of 2 cases." Journal of Neurosurgery 121, no. 5 (2014): 1264-1270.
19. Nicoson, Michael C., Michael J. Franco, and Thomas H. Tung. "Donor nerve sources in free functional gracilis muscle transfer for elbow flexion in adult brachial plexus injury." Microsurgery 37, no. 5 (2017): 377-382.
20. Maldonado, Andrés A., Michelle F. Kircher, Robert J. Spinner, Allen T. Bishop, and Alexander Y. Shin. "Free functioning gracilis muscle transfer with and without simultaneous intercostal nerve transfer to musculocutaneous nerve for restoration of elbow flexion after traumatic adult brachial pan-plexus injury." The Journal of Hand Surgery 42, no. 4 (2017): 293-e1.

Editorial

Artificial Intelligence: Future Trends in Plastic Surgery

Mustehsan Bashir, Saadia Nosheen Jan

The human mind utilizes only a paltry percentage of its capabilities. Seemingly this fraction has sufficed well for humans to survive and progress. Seemingly also, the human mind is wary using its own resources. Shrewd even in parsimony, it perpetually devises short cuts that would lay the Holy Grail at its feet in no time with remarkable accuracy and minimal effort. Intelligence formerly, was a trait inherently attributed to living things. The brain tired of all the drudgery, employed itself to create Artificial intelligence (AI), a system that like a loyal, hard- working serf endlessly churns out solutions in no time with remarkable accuracy.

The 21st Century has seen a surge in the use of AI in almost every walk of life including Plastic Surgery. Replete with Artificial Neural Networks (ANNs), these systems can predict and detect a plethora of pathologies to prognosticate with uncanny precision (1). Examples are AI systems devised to scan the face and predict the mortality of septic patients. Depth of burn and healing time can be gauged with an 86% accuracy(2). Smartphone apps can be downloaded to predict flap survival based on skin color with sensitivities and specificities of 92% and greater(3). The Deep Ensemble for Recognition of Melanoma ANN can predict and detect melanomas facilitating early decision making and improved survival (4). 3D facial models can enhance facial transplant and reconstruction outcomes. Facial recognition technology installed in smartphones is being used to compare patient facial characteristics with classic beauty standards taking biometric measurements. Patients can then realistically compare their expectations to the predicted outcomes(5). Similarly, Artificial Intelligence can be used for better real time imaging of breast lesions, breast density and other characteristics that can enhance decision-making for the surgeon and patient with improved liaison and patient satisfaction.(6)

Artificial Intelligence in plastic surgery in the future seems to be an indispensable and inextricable component for better outcomes. The algorithms involved in devising this technology may be abstruse, but the technology itself is simple and available at the tap of a button.

References

1. Jarvis T, Thornburg D, Rebecca AM, Teven CM. Artificial Intelligence in Plastic Surgery: Current Applications, Future Directions, and Ethical Implications. Plast Reconstr Surg Glob Open. 2020;8(10):e3200.
2. Yeong E-K, Hsiao T-C, Chiang HK, Lin C-W. Prediction of burn healing time using artificial neural networks and reflectance spectrometer. Burns. 2005;31(4):415-20.
3. Kiranantawat K, Sitpahul N, Taeprasartsit P, Constantinides J, Kruavit A, Srimuninnimit V, et al. The first Smartphone application for microsurgery monitoring: SilpaRamanitor. Plastic and reconstructive surgery. 2014;134(1):130-9.
4. Phillips M, Greenhalgh J, Marsden H, Palamaras I. Detection of malignant melanoma using artificial intelligence: an observational study of diagnostic accuracy. Dermatology practical & conceptual. 2020;10(1).
5. Zuo KJ, Saun TJ, Forrest CR. Facial recognition technology: a primer for plastic surgeons. Plastic and reconstructive surgery. 2019;143(6):1298e-306e.
6. Murphy DC, Saleh DB. Artificial Intelligence in plastic surgery: What is it? Where are we now? What is on the horizon? Ann R Coll Surg Engl. 2020;102(8):577-80.

INSTRUCTIONS TO THE AUTHORS AND REVIEWERS OF THE MANUSCRIPTS

(Base upon Minimum Requirements for Writing and Editing of Manuscripts)

Introduction

The new Editorial Board of Pakistan Journal of Plastic Surgery during its meeting held on January, 2019 decided to follow the "Uniform requirements for manuscripts submitted to Biomedical Journals: writing & Editing for Biomedical Publications by International Committee of Medical Journal Editors. A brief account of minimum requirements is given below for assisting the authors, reviewers and editors, the full text can be read, (www.icmje.org). Moreover plagiarism policy of ICMJE, Higher Education Commission and PMDC will be observed. It is authors' responsibility to apprise them of plagiarism in any form including paraphrasing and self plagiarism. The Plagiarism Standing Committee of Pakistan Journal of Plastic surgery would deal with cases of plagiarism and comprise of staff members, and editors. Those claiming intellectual/ idea or data theft of an article must provide documentary proof in their claim otherwise their case will be sent for disciplinary action.

General Principles

1. Title Page

The title page should carry the following information:

1. The title of the article. Concise titles are easier to read than long, convoluted ones. Authors should include all information in the title that will make electronic retrieval of the article both sensitive and specific.
2. Authors' names and Title of the Program. The names and other relevant information should be on title page only to ensure blind peer review of research article.
3. The name of the department(s) and institution(s) to which the work should be attributed.
4. Disclaimers, if any.
5. Corresponding authors. The name, mailing address, telephone and fax numbers, and e-mail address of the author responsible for correspondence about the manuscript.
6. Source(s) of support in the form of grants, equipment, drugs, or all of these.
7. Word counts. A word count for the text only (excluding abstract, acknowledgments, figure legends, and references). A separate word count for the Abstract is also useful for the same reason.
8. The number of figures and tables.
9. Conflict of Interest Notification Page

2. Conflict of Interest Notification Page

To prevent the information on potential conflict of interest for authors from being overlooked or misplaced, it is necessary for that information to be part of the manuscript. It should therefore also be included on a separate page or pages immediately following the title page.

3. Abstract and Key Words

An abstract (requirements for length and structured format vary by journal) should follow the title page. The abstract should provide the context or background for the study and should state the study's purposes, basic procedures (selection of study subjects or laboratory animals, observational and analytical methods), main findings (giving specific effect sizes and their statistical significance, if possible), and principal conclusions. It should emphasize new and important aspects of the study or observations.

Authors are requested to provide, and identify as such, 3 to 10 key words or short phrases that capture the main topics of the article. These will assist indexers in cross-indexing the article and may be published with the abstract. Terms from the Medical Subject Headings (MeSH) list of Index Medicus should be used.

4. Introduction

Provide a context or background for the study (i.e., the nature of the problem and its significance). State the specific purpose or research objective of, or hypothesis tested by, the study or observation; the research objective is often more sharply focused when stated as a question. Both the main and secondary objectives should be made clear, and any pre-specified subgroup analyses should be described. Give only strictly pertinent references and do not include data or conclusions from the work being reported.

5. Material and Methods

The Methods section should include only information that was available at the time the plan or protocol for the study was written; all information obtained during the conduct of the study belongs in the Results section.

(a) Selection and Description of Participants

Describe your selection of the observational or

experimental participants (patients or laboratory animals, including controls) clearly, including eligibility and exclusion criteria and a description of the source population. The guiding principle should be clarity about how and why a study was done in a particular way. When authors use variables such as race or ethnicity, they should define how they measured the variables and justify their relevance.

(b) Technical Information

Identify the methods, apparatus (give the manufacturer's name and address in parentheses), and procedures in sufficient detail to allow other workers to reproduce the results. Give references to established methods, including statistical methods (see below); provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods, give reasons for using them, and evaluate their limitations. Identify precisely all drugs and chemicals used, includ-ing generic name(s), dose(s), and route(s) of administration. Also describe diagnostic or therapeutic procedures if part of the study design.

(c) Statistics

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Define statistical terms, abbreviations, and most symbols. Specify the computer soft-ware used.

6. Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations.

When data are summarized in the Results section, give numeric results not only as derivatives (for example, percentages) but also as the absolute numbers from which the derivatives were calculated, and specify the statistical methods used to analyze them. Restrict tables and figures to those needed to explain the argument of the paper and to assess its support. Use graphs as an alternative to tables with many entries; do not duplicate data in graphs and tables.

7. Discussion

Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or the Results section. For experimental studies it is useful to begin the discussion by summarizing briefly the main findings, then explore possible mechanisms or explanations for these find-ings, compare and contrast the results with other relevant studies, state the limitations of the study, and explore the implications of the findings for future research and for clinical practice.

Link the conclusions with the goals of the study but avoid unqualified statements and conclusions not adequately supported by the data. Avoid claiming priority and alluding to work that has not been completed. State new hypotheses when warranted.

8. References

(a) General Considerations Related to References

Although references to review articles can be an efficient way of guiding readers to a body of literature, review articles do not always reflect original work accurately. Small numbers of references to key original papers will often serve.

Avoid using abstracts as references. References to papers accepted but not yet published should be designated as "in press" authors should obtain written permission to cite such papers as well as verification that they have been accepted for publication. Informa-tion from manuscripts submitted but not accepted should be cited in the text as "unpublished observations" with written permission from the source.

Avoid citing a "personal communication" unless it provides essential information not available from a public source, in which case the name of the person and date of communication should be cited in parentheses in the text. For scientific articles, authors should obtain written permission and confirmation of accuracy from the source of a personal communication.

For articles published in journals indexed in MEDLINE, the Pakistan Journal of Plastic Surgery considers PubMed (http://www.pubmed.gov) the authoritative source for information about retractions.

(b) Reference Style and Format

The Uniform Requirements style is based largely on an ANSI standard style adapted by the National Library of Medicine (NLM) for its databases. For samples of reference citation formats, authors should consult National Library of Medicine web site.

References should be numbered consecutively in the order in which they are first mentioned in the text. Identify references in text, tables, and legends by Arabic numerals in parentheses. The titles of journals should be abbreviated according to the style used in Index Medicus. Consult the list of Journals Indexed for MEDLINE, published annually as a separate publication by the National Library of Medicine.

9. Tables

Tables capture information concisely, and display it efficiently; they also provide information at any desired level of detail and precision. Including data in tables rather than text frequently makes it possible to reduce the length of the text.

Type or print each table with double spacing on a separate sheet of paper. Number tables consecutively in the order of their first citation in the text and supply a brief title for each. Do not use internal horizontal or vertical lines. Give each column a short or abbreviated heading. Authors should place explanatory matter in footnotes, not in the heading. Be sure that each table is cited in the text.

10. Illustrations (Figures)

Figures should be either professionally drawn and photo-graphed, or submitted as photographic quality digital prints. In addition to requiring a version of the figures suitable for printing, Pakistan Journal of Plastic Surgery ask authors for electronic files of figures in a format (e.g., JPEG or GIF) that will produce high quality images in the web version of the journal; authors should review the images.

For x-ray films, scans, and other diagnostic images, as well as pictures of pathology specimens or photomicrographs, send sharp, glossy, black-and-white or color photo-graphic prints, usually 127 x 173 mm (5 x 7 inches). Letters, numbers, and symbols on Figures should therefore be clear and even throughout, and of sufficient size that when reduced for publication each item will still be legible. Figures should be made as self-explanatory as possible, since many will be used directly in slide presentations. Titles and de-tailed explanations belong in the legends, however, not on the illustrations themselves.

Photomicrographs should have internal scale markers. Symbols, arrows, or letters used in photomicrographs should contrast with the background.

If photographs of people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph. When-ever possible permission for publication should be obtained.

Figures should be numbered consecutively according to the order in which they have been first cited in the text.

11. Legends for Illustrations (Figures)

Type or print out legends for illustrations using double spacing, starting on a separate page, with Arabic numerals cor-responding to the illustrations. When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend.

12. Units of Measurement

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples.

Temperatures should be in degrees Celsius. Blood pressures should be in millimeters of mercury, unless other units are specifically required.

13. Abbreviations and Symbols

Use only standard abbreviations; the use of non-standard abbreviations can be extremely confusing to readers. Avoid abbreviations in the title. The full term for which

14. Drug Name

Generic names should be used. When proprietary brands are used in research, include the brand name and the name of the manufacturer in parentheses after first mentioning of the generic name in the Methods section.

15. Guidelines for Authors and Reviewers

All material submitted for publication should be sent exclusively to the Pakistan Journal of Plastic Surgery. Work that has already been reported in a published paper or is described in a paper sent or accepted elsewhere for publication, should not be submitted. Multiple or duplicate submission of the same work to other journal should be avoided as this fall into the category of publication fraud and are liable for disciplinary consequences, including reporting to Pakistan Medical & Dental Council and Higher Education Commission. A complete report following publication of a preliminary report, usually in the form of an abstract, or a paper that has been presented at a scientific meeting, if not published in full in a proceedings or similar publication, may be submitted. Press reports of meetings will not be considered as breach of this rule, but additional data or copies of tables and illustrations should not amplify such reports. In case of doubt, a copy of the published material should be included with a

manuscript for editors' consideration.

Authors can submit their articles by post or by E-mail: pjpspakistan@gmail.com to the Editor, Pakistan Journal of Plastic Surgery. Article can also be submitted by post or by hand on a Compact Disc (CD) with three hard copies. Articles submitted by E-mail are preferred mode of submission and do not require any hard copy.

All authors and co-authors must provide their contact telephone/cell numbers and E-mail addresses only on the title page of manuscript.

A duly filled-in author's certification proforma is mandatory for publication. The duly signed ACP must be returned to the Pakistan Journal of Plastic Surgery office as soon as possible. The sequence / order of the authors on ACP once submitted shall not be changed at any stage.

It is mandatory to provide the institutional ethical review board / committee approval for all research articles, at the time of submission of article.

The editors reserve the right to edit the accepted article to conform to the house-style of the Journal.

16. General archival and linguistic instructions

Authors should submit the manuscript typed in MS Word. Manuscripts should be written in English in British or American style/format (same style should be followed throughout the whole text), in past tense and third person form of address. Sentences should not start with a number or figure. Any illustrations or photographs should also be sent in duplicate. Components of manuscript should be in the following sequence: a title page (containing names of authors, their postal and Email addresses, fax and phone numbers, including mobile phone number of the corresponding author), abstract, key words, text, references, tables (each table, complete with title and footnotes) and legends for llustrations and photographs. Each component should begin on a new page. The manuscript should be typed in double spacing as a single column on A4 (8-1/2" x 11" or 21.5 cm x 28.0 cm), white bond paper with one inch (2.5 cm) margin on one side.

Sub-headings should not be used in any section of the script except in the abstract. In survey and other studies, comments in verbatim should not be stated from a participating group. Acknowledgements are only printed for financing of a study or for acknowledging a previous linked work.

From January 2016, all randomized trials should also provide a proof of being registered at the **International RCT Registry.**

17. Material for Publication

The material submitted for publication may be in the form of an Original research (Randomized controlled trial - RCT, Meta-analysis of RCT, Quasi experimental study, Case Control study, Cohort study, Observational Study with statistical support etc), a Review Article, Commentary, a Case Report, Recent Advances, New techniques, Debates, Adverse Drug Reports, Current Practices, Clinical Practice Article, Short Article, KAP (Knowledge, Attitudes, Practices) study, An Audit Report, Evidence Based Report, Short Communication or a Letter to the Editor. Ideas and Innovations can be reported as changes made by the authors to an existing technique or development of a new technique or instrument. A mere description of a technique without any practical experience or innovation will be considered as an update and not an original article. Any study ending three years prior to date of submission is judged by Editorial Board for its suitability as many changes take place over the period of time, subject to area of the study. Studies more than three years old are not entertained. In exceptional cases, if Editorial Board is of the view that data is important, an extension of one year may be granted. Pakistan Journal of Plastic Surgery also does not accept multiple studies/multiple end publications gathered/derived from a single research project or data (wholly or in part) known as 'salami slices'.

Original articles should normally report original research of relevance to clinical medicine. The original paper should be of about 2000-2500 words excluding abstract and references. It should contain a structured abstract of about 250 words. Three to 10 keywords should be given for an original article as per MeSH (Medical Subject Headings). There should be no more than three tables or illustrations. The data should be supported with 20 to 25 references, which should include local as well as international references. Most of the references should be from last five years from the date of submission.

Clinical Practice Article is a category under which all simple observational case series are entertained. The length of such article should be around 1500 - 1600 words with 15 - 20 references. The rest of the format should be that of an original article. KAP studies, Audit reports, Current Practices, Survey reports and Short Articles are also written on the format of Clinical Practice Article. Evidence based reports must have at least 10 cases and word count of 1000 - 1200 words with 10 - 12 references and not more than

2 tables or illustrations. It should contain a non-structured abstract of about 150 words. Short communications should be of about 1000 - 1200 words, having a non-structured abstract of about 150 words with two tables or illustrations and not more than 10 references. Clinical case reports must be of academic and educational value and provide relevance of the disease being reported as unusual. Brief or negative research findings may appear in this section. The word count of case report should be 800 words with a minimum of 3 key words. It should have a non-structured abstract of about 100 - 150 words (case specific) with maximum of 5 - 6 references. Not more than 2 figures shall be accepted.

Review article should consist of critical overview/analysis of some relatively narrow topic providing background and the recent development with the reference of original literature. It should incorporate author's original work on the same subject. The length of the review article should be of 2500 to 3000 words with minimum of 40 and maximum of 60 references. It should have non-structured abstract of 150 words with minimum 3 key words. An author can write a review article only if he/she has written a minimum of three original research articles and some case reports on the same topic.

Letters should normally not exceed 400 words, with not more than 5 references and be signed by all the authors-maximum 3 are allowed. Preference is given to those that take up points made in contributions published recently in the journal. Letters may be published with a response from the author of the article being discussed. Discussions beyond the initial letter and response will not be entertained for publication. Letters to the editor may be sent for peer review if they report a scientific data. Editorials are written upon invitation.

Between 3 to 10 key words should be given for all the category of manuscripts under the abstracts as per mesh [medical subject heading].

18. Thesis Based Article

Thesis based article should be re-written in accordance with the journal's instructions to the author guidelines.

Article shall undergo routine editorial processing including external review based upon which final decision shall be made for publication. Such articles, if approved, shall be published under the disclosure by author that 'it is a Thesis based article'.

19. Ethical Considerations

If tables, illustrations or photographs, which have already been published, are included, a letter of permission for re-publication should be obtained from author (s) as well as the editor of the journal where it was previously published. Written permission to reproduce photographs of patients, whose identity is not disguised, should be sent with the manuscript; otherwise the eyes will be blackened out. If a medicine is used, generic name should be used. The commercial name may, however, be mentioned only within brackets, only if necessary. In case of medicine or device or any material indicated in text, a declaration by author/s should be submitted that no monetary benefit has been taken from manufacturer/importer of that product by any author. In case of experimental interventions, permission from ethical committee of the hospital should be taken beforehand. Any other conflict of interest must be disclosed. All interventional studies submitted for publication should carry Institutional Ethical & Research Committee approval letter.

Ethical consideration regarding the intervention, added cost of test, and particularly the management of control in case-control comparisons of trials should be addressed: multi-centric authors' affiliation may be asked to be authenticated by provision of permission letters from ethical boards or the heads of involved institutes.

20. Authorship Criteria

As stated in the Uniform Requirements, credit for authorship requires substantial contributions to (a) the conception and design or analysis and interpretation of the data, (b) the drafting of the article or critical revision for important intellectual content, critical appraisal of findings with literature search and actual write up of manuscript, (c) final approval of the version to be published. Each author must sign a statement attesting that he or she fulfills the authorship criteria of the Uniform Requirements.

The Journal discourages submission of more than one article dealing with related aspects of the same study. The journal also discourages the submission of case reports unless unreported from Pakistan. Unusual but already reported cases should, therefore, be submitted as letters to the editor.

21. Copyright

The Pakistan Journal of Plastic Surgery is the owner of all copyright to any work published by the journal. Authors agree to execute copyright transfer of their Forms-ACP (Authors Certification Proforma) as

requested with respect to their contributions accepted by the journal.

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22. Proofs

Page proofs will be emailed, without the original manuscript, to the corresponding author for proof correction and should be returned to the editor within three days. Major alterations from the text cannot be accepted. Any alterations should be marked, preferable in red.